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Electronics

AUSTRALIA with Professional Electronics & ETI

Volume 60, No.1
January 1998

AUSTRALIA'S LARGEST SELLING ELECTRONICS MAGAZINE — ESTABLISHED IN 1922

"Exemplary performance"

When you're choosing a CD player, don't expect top performance from a multi-disc changer — right? Not any more, as Louis Challis discovered when he tested the new NAD 515. A five-disc unit, its performance turned out to be "exemplary". See his review, starting on page 10...

New digital camcorder

What kind of performance can you expect from the latest digital camcorders — are they worth the much higher price? Barrie Smith has been trying out the new Panasonic NV-DS5, and reports on what he found in his review starting on page 14.

On the cover

Can $15 worth of parts in a jiffy box be used to cure serious diseases like cancer or HIV/AIDS? People are selling such devices — right here in Australia — and claiming that they can. Desperate people are believing this and similar wild claims, too; see our article starting on page 24. (Photo by Michael Pugh)

World of Electronics

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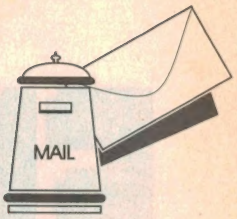
ELECTRONICS AUSTRALIA is published by Federal Publishing Company, a division of Eastern Suburbs Newspapers Partnership, which is owned by
General Newspapers Pty Ltd.
A.C.N.000 117 322,
Double Bay Newspapers Pty Ltd.
A.C.N.000 237 598, and
Brehmer Fairfax Pty Ltd.
A.C.N.008 629 767,
180 Bourke Road, Alexandria, NSW 2015.

Printed by Macquarie Print, 51 - 59 Wheelers Lane, Dubbo 2830. Phone (02) 68 843 444.
Distributed by Newsagents Direct Distribution Pty Ltd, 150 Bourke Rd, Alexandria 2015; phone (02) 9353 9911.
ISSN 1328-6218
* Recommended & maximum Australian retail price.
Member of the Audit Bureau of Circulations

LETTERS TO THE EDITOR



Cellphone shielding

We have been getting a lot of enquiries forwarded by our parent company in the UK, from your readers enquiring about the Microshield protective case which reduces microwave radiation levels by over 90% from mobile phones.

As you are aware this topic has been a hot debate this year in Australia.

Could you please inform readers that if they wish to know more information regarding this issue, we are now operating in Australia and readers enquiring should contact me at Microshield Industries (Australia) Pty Ltd. Our telephone number is (02) 9212 4333, fax (02) 9212 4633.

Joseph Pirzada, Director
Microshield Industries (Aust.)
PO Box 621,
Darlinghurst 2010.

Frequency shifter: I

Some recent correspondence received by the magazine has exposed a need to carefully define the intended application of my Audio Frequency Shifter (AFS) project as described in the August 1997 issue.

As frequency shifters have been used for over 20 years for the control of acoustic feedback in PA systems, their merit is not in doubt — but neither are they a panacea for problem systems. Those installations involving microphones placed opposite loudspeakers are bound to be plagued by feedback, while other dubious schemes seem intent on defying the laws of physics.

The mark of a success in a PA system is having enough margin between the level of the original sound at the microphone and that finding its way back from the loudspeakers to avoid running the system on the edge of instability, yet still create an adequate sound level in the audience. The 'magic trick' employed by many PA experts involves reducing the gap between microphone and mouth.

Using the AFS will normally enhance a PA system's overall stability in acoustically live environments, provided that the microphone is not sited in the direct sound field of loudspeakers. If incorporated into a typical PA system in a hall, church or public auditorium its use will largely remove the aggravating effect reverberation has on acoustic feedback — something only frequency shifting is able to do, by merely switching it on.

Phil Allison,
Sydney.

Frequency shifter: II

I have for many years been the Audio Tech with one of Melbourne's amateur theatre companies. My professional experience is mostly with digital electronics but I maintain an interest in audio things.

When the frequency shifter project appeared in the August issue of *EA*, I just had to build it. And it worked just great, so I built a second one. I mounted both in a 1U 19" case, which perhaps wasn't the easiest way to do it since I fitted XLR connectors for input and output. One modification that I made was to use only one 5Hz oscillator and connect it to both boards.

The first show that I ran using the frequency shifter was the 'Kids Show'. The theatre that I operate in is a 400-seat, steeply raked auditorium. Due to cost I have a limited number of microphones available, seven in total, to cover a stage 15 metres wide and seven metres deep. Not very much given that the screaming monsters suddenly go quiet when on stage.

So, I usually have the gain wound up as high as it will go, and endure a little 'ringing'. But the frequency shifter fixed all that. Loads of sound, no problems. One effect that I noticed is that when we were rehearsing with the theatre nearly empty, there was a distinct echo quality to the sound, which disappeared when playing to an audience. Just goes to show how much the system could tolerate.

I am currently working on another show, with adults, and getting great results. There is just one minor problem though. I usually play a CD before the show and during interval, just so it isn't too silent. If the frequency shifter is engaged, there is a distinct low frequency modulation of the music.

At first I thought my CD player was sick, but it is definitely caused by the

frequency shifter. I have it installed between the mixer output and the power amplifier and both the microphones and the CD connect into the mixer. It is no real problem, since the microphones are shut off whilst there is music playing, and I (now) use the bypass switch on the frequency shifter.

Thanks again for an interesting and useful project, keep up the good work.

Michael J. Grant
East Malvern, Vic.

Exploding desolderer

I write to you regarding the continuing saga of the exploding Den-on desoldering tools. You may be interested to know that just hours after reading the letter from Mr. Michael O'Neill of Mektronics Co Pty Ltd in your October issue, in which he assured your readers that the Den-on SC7000 de-soldering tool (which supersedes the original SC5000) rectified the design fault causing the reported catastrophic failures, my SC7000 exploded violently in my hand.

On return of this less than two year old unit to Mektronics for inspection, and following subsequent discussion with Mr O'Neill, he was unable to offer any explanation as to why the SC7000 obviously has the same vulnerability as the SC5000.

I believe your other readers who use these Den-on tools should be warned that they can be rather dangerous, INCLUDING the supposedly improved model SC7000, and use them with great care. Regular inspection and cleaning of the internal PC boards would seem to be be a minimum requirement.

Frank Russell, Manager
Media Technology Services
University of Ballarat.

Christmas lights

Just a quick suggestion for the Christmas Light Controller on page 60 of the November 1997 issue.

When mounting the mains sockets on the side of the box, orientate them at 45 degrees clockwise from the vertical position, as this will enable most side-entry plugs to be used as well as bottom-entry ones. This includes most of the 'piggyback' styles as well.

Eric van de Weyer, VK2KUR
Vaucluse, NSW. ❖

Letters published in this column express the opinions of the correspondents concerned, and do not necessarily reflect the opinions or policies of the staff or publisher of Electronics Australia. We welcome contributions to this column, but reserve the right to edit letters which are very long or potentially defamatory.

EDITORIAL VIEWPOINT

A disconcerting look at the shadier side of electronics

Whether you're involved in electronics as a career in itself, as an industry which provides the tools to facilitate your work, as a keen hobby enthusiast — or perhaps simply as an interested consumer — you'll probably agree that overall, this branch of technology has made very significant contributions to modern society. There's hardly an area of human activity where electronics *hasn't* allowed dramatic improvements in one aspect or another: convenience, effectiveness, safety, productivity or whatever.

Take medicine, for example. Over the last five or six decades, electronics has provided all manner of equipment to allow physicians to diagnose diseases faster and more effectively than before, to allow surgeons to operate much more safely than before and to allow many kinds of therapists to treat numerous ailments more effectively than ever before. The list of electronic aids to medicine and human health as a whole is almost endless: think of electronic thermometers, heart pacemakers, defibrillators, electrocardiographs, electroencephalographs, X-ray machines, CAT and PET scanners, intravenous drip timers, electron and scanning electron microscopes, gas analysers, diathermy machines, audiometers and bone growth stimulators to name only a few.

All of these 'mainstream' applications are based on solid scientific and engineering principles, and as a result we all tend to see electronics as a thoroughly credible and reputable contributor to the goal of minimising human pain and suffering. Yet it's recently come to my attention that there's another, somewhat *darker* side to the area where electronics intersects with medicine and human health.

It appears that especially in recent years, a huge 'alternative' electronics-and-health industry has developed, with all manner of self-styled experts purporting to have developed devices claimed to be capable of diagnosing and/or achieving miraculous cures for a huge number of diseases and disorders — everything from arthritis through to cancer, HIV/AIDS, hepatitis and glandular fever. The devices range from pocket-sized gadgets containing less than $15 worth of common components, through what appears to be modified versions of standard low-frequency function generators, to 'up-market' PC based systems claiming to be able to diagnose what ails you from skin resistance and/or muscle reflexes (and then treat the problem via remote control).

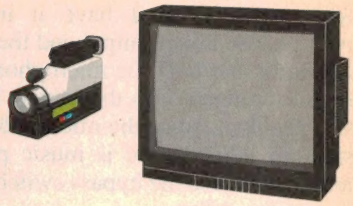
Like me, you may not have even heard of this dark side of electronics before, or had any idea of the way quite a few of its less scrupulous practitioners seem to be making a lot of money preying on the desperation of seriously ill people. It was only after I received a letter and a parcel of supporting evidence from a concerned health worker that I was awakened myself, and prompted to make further enquiries.

As you'll find from this month's Forum (see page 24), what I've found already is quite worrying — I can see why so many legitimate health workers are very concerned. When you read the article, I think *you* will be too.

Jim Rowe

WHAT'S NEW

IN THE EVER-CHANGING WORLD OF ELECTRONICS



Affordable Bose home theatre sound system

Bose has launched its most affordable home theatre speaker system yet, with the Acoustimass-6. The new speaker system incorporates much of the innovative technology developed for the top of the line Acoustimass-10, to provide quality surround sound at a low price.

The five single cube speakers are voice matched and aesthetically identical, yet are engineered differently to provide optimal sound for both home theatre and stereo applications of the system. The two left and right front speakers are designed to powerfully reproduce the wide range of frequencies found in most stereo music. The centre/surround cubes feature different sensitivity and bandwidth to their companions, in order to match the characteristics of surround sound receivers.

The speakers are magnetically shielded so as not to cause video interference when placed near the television, and come with colour coded connectors for foolproof setup.

The bass module uses the same three-chamber design developed for the Acoustimass-10. This results in deep, powerful bass with no audible distortion, while creating the illusion that all the sound is coming from the small cube speakers.

The Acoustimass-6 system can be used with any home theatre package and is compatible with all surround sound receivers, including Pro Logic and Dolby Digital (AC-3). It carries an RRP of $1699. For further information circle 142 on the reader service card or call Bose toll free on 1800 816 774.

Projection TV has 127cm screen

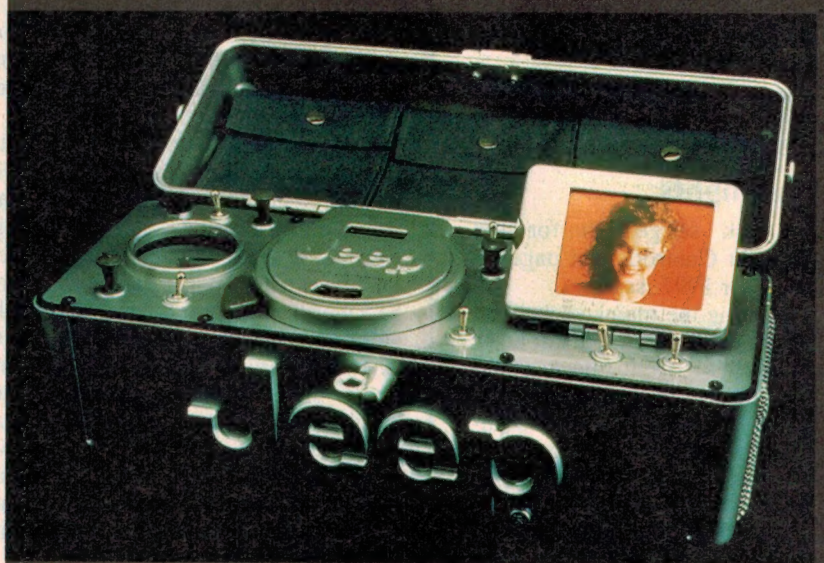
Mitsubishi Electric's new Diva Legend projection TV is claimed to lift home theatre to new heights, by bringing the action and excitement of the movies into the comfort of your living room. With its impressive 127cm screen, the image is almost twice the size of an ordinary large screen TV, and its wide viewing angle is said to allow viewing from almost anywhere in the room.

An innovative feature of the Diva Legend is Automatic Digital Convergence, which maintains 'outstanding picture quality' without the viewer having to lift a finger. A hybrid five element lens and lenticular Fresnel screen ensure high brightness and clarity.

Other features include picture memory, stereo sound, picture in picture, child lock, remote control Teletext and an on-screen menu system.

The Mitsubishi Diva Legend carries an RRP of $8250. For more information contact Mitsubishi Electric Consumer Information on 1 800 811 212, or circle 140 on the reader service card.

Entertainment centre for Jeep enthusiasts



US firm Jeep Electronics has released this 'Jeep Boom Box with TV' for people who want a rugged entertainment centre to take with them in their recreational vehicle. It's just fine for keeping up with the baseball game while you're enjoying your Moet and grilled chicken in the parking lot, they claim.

The unit combines a CD player, AM/FM radio and colour TV with 4" colour LCD display, plus CD storage in a rugged and weather resistant portable case...

'Mobile office' computer from Ericsson

Ericsson Australia has launched a 'total data communications' product that's claimed to offer an unprecedented level of flexibility. The Ericsson MC 12 is a palmtop computer with full Windows CE to create and edit documents, together with an inbuilt modem. The MC 12 works with Ericsson's latest mobile phones to send and receive e-mail, and access the Internet from almost anywhere in the world.

The MC 12's modem comes with a cable which plugs into any Ericsson GA 628, GH 688, GF 788 or GF 768 mobile phone. An accessory cable is available to connect the MC 12 to GH 398, GH/GF 388 and GA 318 mobile phones. The MC 12 has 4MB of RAM and 5MB ROM (upgradable), plus a further 2MB of compact flash memory for data backup.

An IrDA transceiver is built in, for infrared connection to external devices including printers and PCs.

Inbuilt software applications include Calendar (which can be viewed by day or by week), detailed Contacts, Tasks, MS Pocket Word to create, edit, and format documents, MS Pocket Excel spreadsheet computing, a Calculator function, MS Pocket Internet Explorer, Inbox to send and receive e-mail and Short Message Service (SMS) to a mobile phone.

The MC 12's LCD screen has a resolution of 640 x 240 pixels, which allows convenient viewing of spreadsheets, Web pages and documents.

For further information contact your nearest Ericsson dealer.

Epson's new PhotoPC 600 has XGA resolution

Epson's new PhotoPC 600 digital camera captures images at 1024 x 768 pixel (XGA) resolution for fine detail viewing on computers, printers and TV. A ColorTrue in-camera processing system ensures that each image also achieves accurate colour, saturation, balance and contrast.

The PhotoPC 600 also provides a PAL video output signal, which lets users play captured images on any television or multimedia projector.

Up to 50 standard VGA, 16 fine XGA or seven SuperFine XGA resolution images can be stored in the internal memory of the camera. It also supports optional removable and reusable ATA-compatible CompactFlash storage cards, to increase the storage capacity.

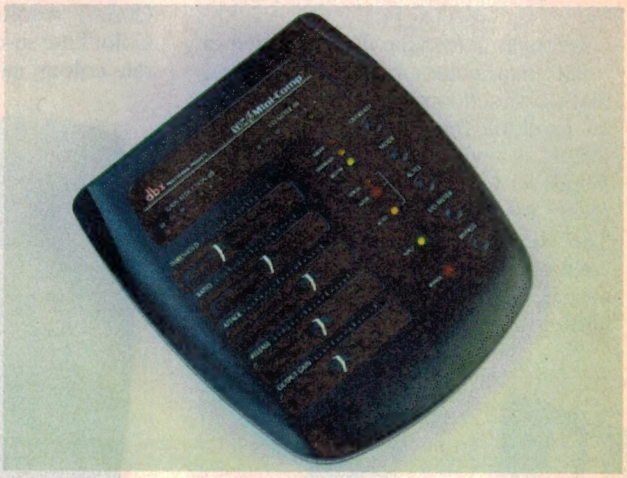
The PhotoPC 600 comes with a built-in 2" TFT colour LCD monitor and real-image optical viewer, giving a choice of two ways to frame an image. It comes bundled with easy-to-use software such as Hot Shots (photo re-touching and creative special effects); NetCard (photo e-mail); and Presto! PhotoAlbum (lets you incorporate images into Web pages).

It has an RRP of $1500. For further information circle 147 on the reader service card or contact your nearest Epson dealer.

Compact DVD player for those on the move

Samsung Electronics has announced what it claims as the world's smallest and lightest digital video disc (DVD) player, the P-Theatre. Weighing only 0.9kg, one-tenth that of any competing products, the P-Theatre combines a portable DVD player and decoder (right) with a head-mounted display.

Compact dbx compressor/limiter



Designed with home studio users in mind, the new MC6 Mini-Comp compressor/limiter from dbx is also ideal for live sound applications, and it's small enough to sit conveniently on a tabletop right next to the mixer. But despite its small size it offers features normally only found on much larger units.

The MC6 allows manual adjustment of attack release times or the now famous dbx program-dependant auto function. Two auto-modes are offered, one optimised to vocal applications, the other to instrument applications.

The MC6 also features full stereo operation, rear panel footswitch bypass jack for hands-free use, switchable line or instrument level operation, full eight step input/output/gain reduction metering and switchable OverEasy or hard knee compression.

For more information circle 143 on the reader service card or contact dbx distributors Jands Electronics, 40 Kent Road, Mascot 2020.

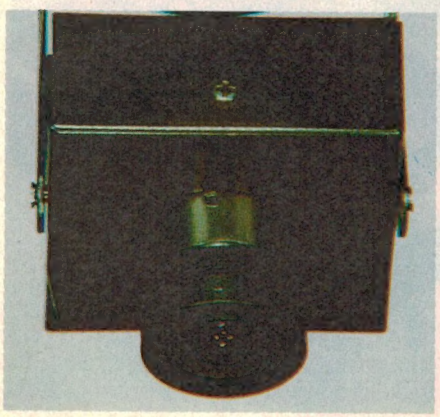
Tiny video surveillance camera

This tiny new CCD video surveillance camera from Allthings Sales & Services has a metal case and is supplied with a metal wall mounting bracket. It can be supplied with either a 3.6mm board lens or a 5.5mm pinhole lens, and measures 36 x 36mm by either 27mm (board lens) or 17mm (pinhole lens). It's claimed to be small enough for discreet installations yet obvious enough to provide deterrence value and satisfy privacy concerns.

Main specifications are 380+ line horizontal resolution, 0.2 lux sensitivity for low light and infra-red use, and shutter speeds of 1/50 to 1/100,000 sec via a linear automatic electronic shutter. A 2.1mm socket is provided for 12V DC power, and output is standard 75Ω composite video via a BNC socket.

Many options and accessories are available. The price, with either 3.6mm or 5.5mm lens is only $99.00 including tax.

For further details circle 144 on the reader service card or contact Allthings Sales & Services; phone (08) 9349 9413.



Samsung's large LCD screen

Samsung Electronics has announced what is claimed as the world's first 30" single glass TFT (thin film transistor) driven LCD (liquid-crystal display) screen, pictured. The next-generation display can function as both a high definition multimedia display for computers or a wall-hanging screen for TV.

Compact CD changer for cars

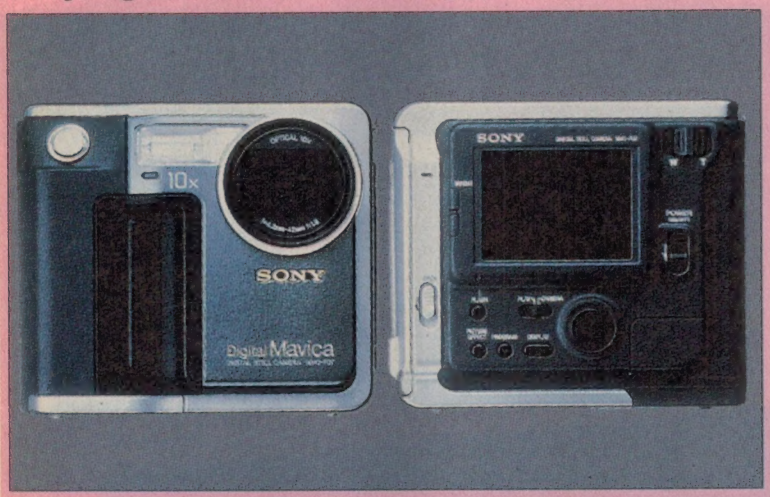
For car audio enthusiasts who do not need the ability to play more than six discs, or whose vehicles do not offer sufficient mounting space, Pioneer have developed the CDXP620S, claimed as one of the world's smallest car CD changers. The CDX-P620S is around 13% smaller in volume than previous models, and 2.54cm (1") less in width.

The six-disc changer combines classic design and small dimensions with flexibility in mounting angles, to greatly increase installation options. Its suspension can be optimised for mounting angles anywhere between horizontal and vertical, enabling you to mount it virtually anywhere in you car — in the boot, in the console, under a seat or even in the glove box. The changer's design also allows the CDs to be loaded conveniently label up, enabling the user to see the title of the CD.

For additional safety, the changer can be given the ability to respond to spoken commands, by means of Pioneer's optional CD-VC50 Voice Commander. Heralded as a breakthrough, both in terms of innovation and its safety, Pioneer believes this 'say and play' feature could be one of the most innovative car audio features of the decade.

The CDX-P620S has an RRP of $599 and is covered by a 12-month parts and labour warranty. For more information contact Pioneer Electronics Australia or circle 141 on the reader service card.

Sony digital camera uses floppy disks



Sony's new Digital Mavica digital still cameras use a low cost 3.5" floppy disk as their recording medium, rather than expensive memory chips or cards. Images are transferred into a PC simply and easily, via the disks.

The Digital Mavica records up to 40 images in standard JPEG image compression format onto any high density 1.44MB floppy disk, and will even format the disk if necessary. The advantage of using standard JPEG format is that the images can be easily and quickly sent by email without conversion. The images are of 640 x 480 pixel VGA resolution.

The Digital Mavica provides a 2.5" LCD viewing screen on the back and is compatible with computers running Windows 3.1, Windows 95, Windows NT 4.0 or Mac OS System 7.5+.

Two versions of the Mavica will be available in Australia, the standard MVC-FD5 and the high-end MVC-FD7 model. Both feature a built-in flash and timer, and rechargeable lithium ion batteries. As with Sony's Stamina camcorders, the battery power system precisely indicates, to the minute, how much battery time is available.

The advanced MVC-FD7 camera has a 10x optical zoom lens (equivalent to 40mm-400mm lens on a 35mm camera), manual/auto focus and five preprogrammed exposure settings for portraits, bright sunlight, dusk, landscape and high-speed photography.

Both models are extremely compact. The MVC-FD5 weighs just 500g and the MVC-FD7 590g. The RRPs are $1059 for the MVC-FD5 and $2499 for the MVC-FD7.

Video recorder uses a hard disk

Mitsubishi Electric's new DX-TL100E digital time-lapse video recorder is claimed as the surveillance recording unit of the future. It avoids the unreliability and poor picture quality of conventional time-lapse video recorders by not using tape, rubbing heads or motors — instead recordings are stored on a fully contained 2GB high capacity hard disk.

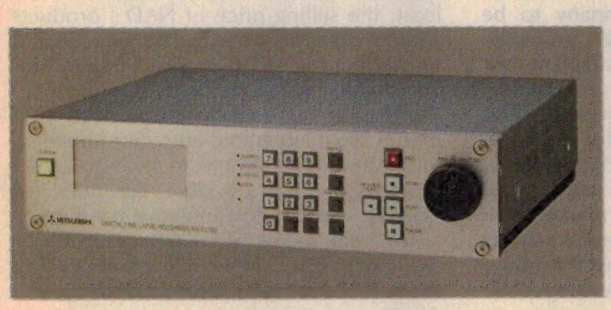
This technology means maintenance costs are lower and the clear, noiseless images with a high resolution of 720 x 240 pixels won't deteriorate with long-term use.

Accurate retrieval of any particular moment of a digital recording is easy and instantaneous. Users can search for particular recordings using the time, date or other criteria such as index alarms or comments recorded at random.

The recorder provides a choice of 10 recording intervals, from one picture every 16 seconds to 25 pictures per second, and six image compression modes. In single shot mode, about 135,000 pictures can be recorded.

An alarm signal switches the recorder into continuous record mode so that it doesn't miss a second. All details of an incident, accident or a disaster are recorded from the beginning of the event that triggered the alarm.

The DX-TL1OOE has an RRP of $6987. For further information circle 146 on the reader service card or contact Mitsubishi Electric at 348 Victoria Road, Rydalmere 2116.



Pioneer changers store up to 100 CDs

Pioneer's new PD-F906 and PD-F805 File-CD players use a space-efficient roulette rack system that can house up to 100 or 50 CDs respectively. Both also have a single loader for one extra disc for instant playback, giving a total of 101 and 51 CDs respectively.

Both the PD-F906 and PD-F805 offer Pioneer's Custom Filing System, which lets you sort the stored discs into three convenient 'customised' categories, allowing you to classify discs by music type, artist, or other classification.

Other features offered by both players include disc illumination, CD-Deck Synchronisation, and memory backup; a liner notes file with numbered stickers for handy reference; and a full-function SR (System Remote) control unit with numeric keypad and DISC SET/TRACK SET keys.

The RRPs for the PD-F906 and PD-F905 are $799 and $599 respectively. For further information circle 145 on the reader service card or contact Pioneer on 1800 060 852. ❖

NAD 515 CD PLAYER

This month our reviewer Louis Challis was able to evaluate the new NAD 515 CP player, a five-disc unit that offers not only impressive features, but a level of performance matching that of virtually any he had yet tested — bar none. In fact some of the measured figures looked so good that he suspected his testing system had developed a fault!

It is my observation that the movers and shakers of the hi-fi industry have always been 'different'. The underlying reasons for founding hi-fi companies have ranged from the sublime to the ridiculous. In the case of the Sony Corporation, the founders faced impending starvation; in the case of Bowers and Wilkins (now B&W, see *EA* September 1997), it was a quest for perfection. The formation of NAD was predicated by what appear to be far more enigmatic issues.

Around 1972, eight men representing various hi-fi marketing companies in the USA, UK, France, Switzerland and Germany met to found a new company that was later to be known by the name NAD (an acronym for New Acoustic Dimension). Although you might suspect that the sole reason for those eight nameless men to form a new company was to market a range of new products, that is only half the story. It appears that each of NAD company's founding fathers was also motivated by a deep personal enthusiasm, and an interest in both music and the fidelity of its reproduction.

Of course NAD was neither the first, nor will it be the last hi-fi company to be owned by, and actively managed by people who are deeply involved in marketing their products. As their accountants undoubtedly told them, if you don't sell your products at a profit, you won't be around for very long.

The founders of NAD had '20/20' vision. That vision was matched by an unequivocal understanding of what the marketplace really craved for. In short order — less than five years — NAD became a major player, marketing products developed by the hi-fi industry and sold through associated and tightly linked companies in more than 40 countries.

The underlying philosophy behind each of NAD's products was that performance ranked higher than appearance, function ranked well above form, and last but not least, the selling price of NAD's products should preferably be lower, and should ideally not exceed the price of any other comparable product. Some of the NAD products were so successful (like the NAD model 3020 integrated amplifier, of which more than 1,000,000 were sold) that NAD rapidly gained an enviable reputation for offering superior cost-effective products.

The real secret of NAD's success was two-fold. Firstly, NAD had its own R&D laboratories in which it could develop and

assess superior circuitry and concepts. Secondly, it contracted out the manufacturing of its products to existing OEM manufacturers, and was thus able to ensure that the cost of production, as well as the quality of its products, were on par with the world's best.

Lost its way

Somewhere along the way, and for unexplained reasons, NAD temporarily lost its direction. We don't know how, and they are tight-lipped about why. NAD's products were still better than most of their competitors, but those products were clearly no longer at the 'top of the tree' as they had been in the past. When that happens, sales drop, profits drop, and if that happens, financial viability and product marketability are immediately prejudiced.

The solution was simple and straightforward; the original shareholders sold out, and a new group took over. The chairman of the new company is Peter Lyngdorf, who is the head of Europe's largest and most successful hi-fi marketing organisation. I have met Peter Lyngdorf on two occasions, the first being during his visit to Australia, and the second whilst on a trip to Bruel & Kjaer in Copenhagen.

On the first occasion when I met Peter, I was extremely impressed by his dynamic personality, as well as by the breadth of his knowledge on new technology and psychoacoustics issues. He combines unusual attributes of respecting technical excellence, whilst paying comparable attention to the importance of his and other people's subjective impressions.

When I met him in Copenhagen he had just embarked on the promotion of a serious R&D investigation at the Danish Technical University at Lyngby. That project was a joint effort between Danish and English loudspeaker manufacturers. Peter had a major shareholding in one of those companies, and had no hesitation in motivating others to join him, in what proved to be a very advanced technical study.

That research project was just one of many which I understand have since followed. More importantly, those studies give a clear indication that NAD will soon market 'world class' loudspeakers to support its broad range of high fidelity products.

Impressive player

The NAD 515 Compact Disc Player stands 'head and shoulders' above previous NAD CD players. Frankly, it is not just different from those players, but generally appears to offer superior performance when compared with most other CD players that either you or I are likely to have used. In fact the 515 appears to be representative of the new breed of NAD's products, and truly epitomises the 'New Acoustic Dimension' acronym.

The player's major attributes are its performance supplemented by ergonomic or 'user-friendly' design — features which are underpinned by the type of functional attributes that most purchasers crave for. For example while many other modern players incorporate the ability of loading and playing five CDs, only a limited number offer the added flexibility of being able to change at least three of the CDs when one is playing.

Another attribute is the ability to gain access to any particular CD by means of a 'QUICK PLAY' function, while the drawer is open. At the extreme outer right hand corner of the slide-out tray are two buttons. The QUICK PLAY button closes the tray and simultaneously rotates the disc closest to the button into the play position, to initiate its play. Adjacent to that button is a second button marked LOAD, which indexes the central turntable two positions at a time (to expedite rapid loading) and at the same time returns the disc that was being played to a position from which it may be conveniently extracted.

The NAD 515's handbook extols the virtues of the design, emphasising that it is able to store in memory up to 30 tracks from any of the five CDs currently loaded. However that function would really only prove to be of value or interest if the number of CDs which you possess is relatively small, and you tend to play only five of them on a regular pre-ordained basis.

The number of controls provided on the front panel of the NAD 515 are limited, and some functions are provided on the front panel that are not duplicated on the remote control. Similarly some functions provided on the remote control are not available on the front panel. The most significant differences are that the selection of discs 1 - 5 can be nominated by pressing one of five pushbuttons on the player's front panel, while the remote provides only a pushbutton labelled 'NEXT DISC'.

The two elongated pushbuttons provided on the front panel of the player act as toggle levers. These respectively provide SKIP FORWARD or REVERSE, or SCAN FORWARD or REVERSE within a given track, depending on which side of the pushbutton you press. The remote control separates these four functions into four pushbuttons.

Reviewing, editing and programming functions for a sequence of tracks on the five different discs, are controlled by three pushbuttons and the 10 numbered buttons on the remote control.

More potent controls are provided by NAD's 'LINK IN' connector, which allows the player to be operated and controlled by means of a multi-room controller or a remote relay system, which NAD (among others) is able to offer.

Where both the IN and OUT connections are made, the remote control commands can be 'daisy-chained' from one system component to the next in the line.

Surprisingly, the remote control does not provide access to the time switch which displays the data as to which disc and track is playing, or how far the play has advanced, the length of time remaining, or how much material remains to be played on the disc.

Inside the 515 player, everything is very neat and tidy. The mechanism is supported by a sturdy ribbed plastic moulding. The electronics includes a premium Burr-Brown DAC module.

The NAD 515 provides conventional high level analog outputs, supplemented by a parallel digital output for feeding to an external 'D to A' converter, or to the digital input of a recorder (DAT, MiniDisc or a CD recorder's input). There can be no denying that with a premium quality CD player many purchasers will want a digital output, even though it may seldom be used.

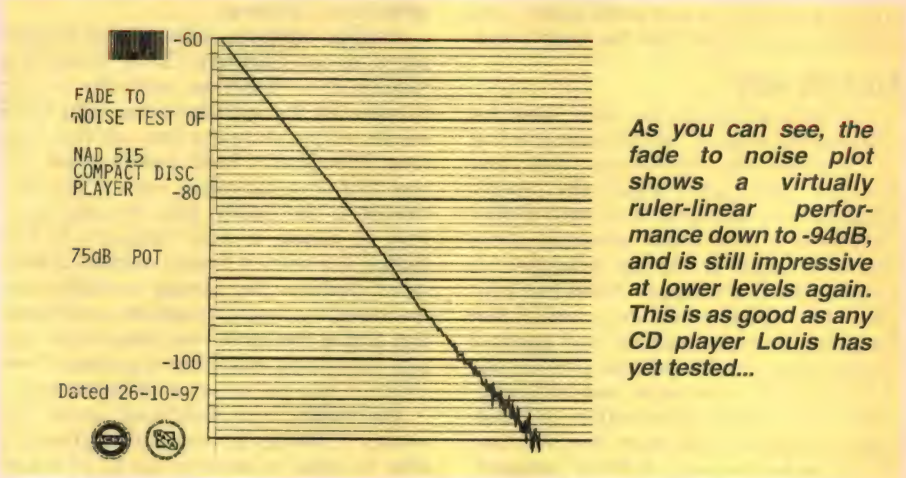
Inside the box

I decided to open up the 515's case to discover what makes this CD player tick. Inside I found a deeply ribbed and extremely rigid plastic moulding supporting the five-disc turntable, and the disc playing mechanism. The power supply was located at one corner of the cabinet, a high quality printed circuit board with excellent labelling was located at the other corner, and a display and control module card incorporating the switching functions was located immediately behind the front panel.

It was apparent that the designers had taken considerable trouble to provide optimum screening. I noted that the main 'D to A' converter chip was a premium Burr-Brown module, with minuscule pitch spacing between the individual connections.

Objective tests

In evaluating the performance of the NAD 515 player I was progressively impressed by each objective performance evaluation as we did them. I soon discovered that the replay frequency response is smooth and remarkably flat (within +/- 0.5dB) all the way up from 5Hz to 22kHz. The output appears to be ruler flat from 16Hz to 2kHz, after which it displays a gentle rise in response which flattens out at the +0.5dB level between 10kHz and 22.1kHz. That response is certainly flat enough for any functional or subjective requirement, and the gentle rise in response may well be regarded as a minor attribute rather than a liability.



As you can see, the fade to noise plot shows a virtually ruler-linear performance down to -94dB, and is still impressive at lower levels again. This is as good as any CD player Louis has yet tested...

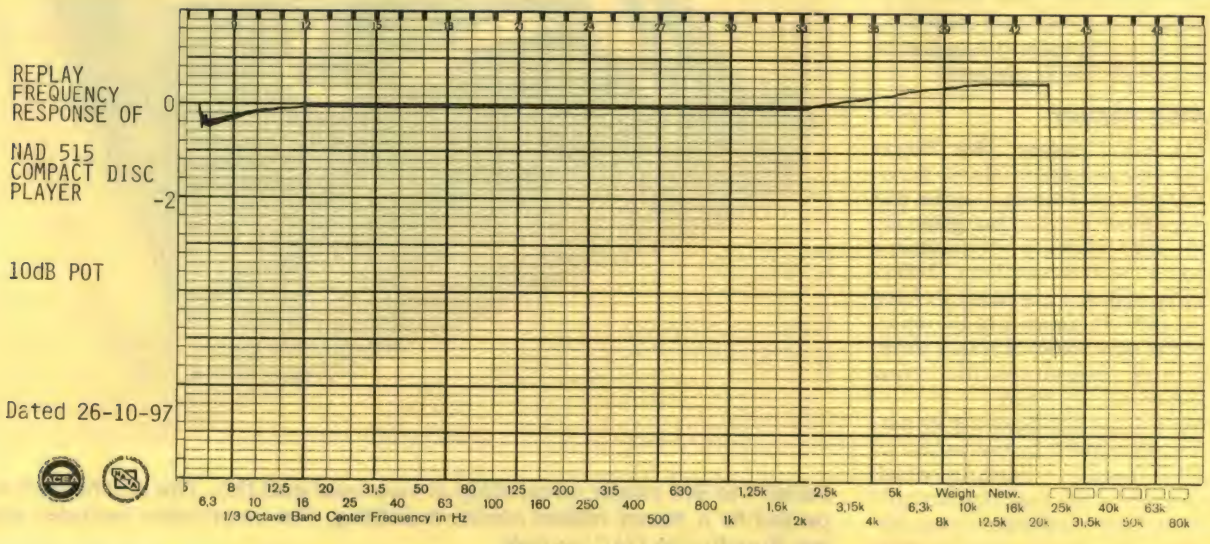
The 515's replay linearity is exemplary. There are obvious advantages in using one of the best Burr-Brown D/A converter chips. That advantage comes by way of enhanced linearity over the range 0 to -90dB, to achieve an exceptionally smooth level of conversion linearity. While the point response evaluation at the 10dB steps indicates just how well the chip's performance is, the 'fade to noise' replay test tracks, covering the range from -60dB to -110dB, do it with considerably greater panache.

As you will see from the plot, the 'fade to noise' replay response really is excellent and equal to the best that I have yet measured (which was recorded with a CD player costing more than four times the price).

When I reached the stage of measuring player's channel separation, and recorded separation figures between the channels which were in the range 115 - 130dB, I started to doubt the veracity of my test equipment. At that stage I reached for my standby measurement system, which has the ability to measure down to 130dB (but not much further). It provided numerical figures which were almost identical with the main system, which lead me to the conclusion that the NAD 515's electronic designers are a very talented group. Those figures are the highest for channel separation that I have yet measured, and would appear to be the industry's best.

As the foregoing results led me to expect, the distortion figures at high signal levels (in the range 0 to -60dB) were also exceptionally good. In fact many of the higher-order harmonic components were literally 'out of range'. It was only with test signals in the range of -70dB to -90dB that the distortion figures become significant — as numbers, but of course they're still insignificant in terms of their psychoacoustic relevance (because they're inaudible).

The signal to noise ratio performance of the NAD 515 is again outstanding, being -126dB(A) 'without emphasis', and -125.7dB(A) 'with



emphasis'. In like manner, the unweighted signal to noise measurements were -114dB and -113dB, which are also outstanding. The significance of those high numbers is that if you were to connect up the NAD 515 to your preamp, amplifier or receiver and you can hear any hum or noise, you could be sure that it would *not* be originating from the 515.

The frequency accuracy of the 19.999kHz signal was exemplary, being only a minuscule 0.003% high. The square-wave response characteristic was also smooth and uniform in character, as was its impulse response.

The next round of tests involved the standard 'black dot' and 'black stripe' tracking tests. The results of those tests were a series of passes, with no sign of signal impairment until the black stripe had blown out to 2000 microns wide — i.e., a black stripe 2mm wide across the disc. Even then, all that I could hear was the onset of a click in the audible output, and no loss of tracking or any other sign of misbehaviour.

The last objective test was for vibration, which involved placing the NAD 515 on our large shaker table. During that test, I subjected the player to increasing levels of vertical vibration whilst it was appropriately constrained on the top of the shaker table.

To my surprise and initial disbelief, I was able to impose a vibration level of 1.5G peak without any sign of loss of output, or any sign of an erratic signal. Now 1.5G in the vertical plane is equivalent to being exposed to a nasty earthquake — not the kind of situation in which I would suggest using the CD player, even though it *would* handle such an eventuality so well.

Listening tests

More than pleased with how well the NAD 515 performed during its objective testing, I happily took it home to assess its subjective performance.

The five discs which I chose to load up were 'Zomba's New Demo' disc (unnumbered) and the 'Opera Italian' (CHAP C9) from Zomba, which features the London Symphony orchestra with unknown singers; 'Illumination', featuring Hildegard Von Bingen's 'Fire of the Spirit' (Sony Classical SK 62853); 'Heaven & Hell' by Joe Jackson & Friend (Sony Classical SK 60273); and Brouwer's 'The Black Decameron' featuring John Williams, the London Sinfonietta and Steven Mercurio (Sony Classical SK 63173).

The first of these discs provided a potpourri of 'A bit of This & That', 'Contemporary and Archival Sacred Music', 'Music from the 1900's right through to the 1980's', 'Ethnic, Classical and Sound Effects', which are representative of Zomba's range of copyright protected commercial software. The quality of sound reproduction was outstanding, and even before listening to the four other discs, my panel and I were impressed by the NAD 515.

This impression was fully confirmed when we played the other four discs as well.

MEASURED PERFORMANCE: NAD 515 CD PLAYER

SERIAL No. SV 029649005158

1. FREQUENCY RESPONSE 5Hz to 22.05kHz +/-0.5dB

2. DIGITAL/ANALOG LINEARITY

Nominal Level	Measured Output L Channel, dB	Measured Output R Channel, dB
0dB	0.0	0.0
-1.0	-1.0	-1.0
-3.0	-3.0	-3.0
-6.0	-6.0	-6.0
-10.0	-10.0	-10.0
-20.0	-20.0	-20.0
-30.0	-30.0	-30.0
-40.0	-40.0	-40.0
-50.0	-50.0	-50.0
-60.0	-60.0	-60.0
-70.0	-70.2	-70.2
-80.0	-80.9	-80.5
-90.0	-90.2	-90.7

3. CHANNEL SEPARATION

Frequency	Right into Left, dB	Left into Right, dB
100Hz	120	115
1kHz	130	>130
10kHz	>130	>130
20kHz	>130	>130

4. DISTORTION

Distortion at 1kHz:

Level	2nd Harmonic	3rd Harmonic	4th Harmonic	5th Harmonic	THD %
0	-91.0	-100.5	-103.3	-106.5	0.003
-10	-97.6	-108.5	-99.0	-103.5	0.0018
-20	-86.5	-95.5	-90.5	-101.5	0.0053
-30	-85.7	-83.5	off scale	-85.5	0.009
-40	off scale	-75.0	off scale	-81.5	0.02
-50	-65.0	-68.0	-72.2	-66.5	0.1
-60	-47.0	-54.0	-61.2	-58.0	0.45
-70	-44.3	-41.5	-50.1	-42.5	1.2
-80	-38.5	-31.2	-46.5	-30.0	3.9
-90	-17.0	-32.1	-31.5	-14.5	23

Distortion at 100Hz:

Level	2nd Harmonic	3rd Harmonic	4th Harmonic	5th Harmonic	THD %
0	-102.0	-106.5	-119.0	-102.0	0.0012
-20	-87.4	-100.3	-90.3	-107.0	0.0053
-40	-79.5	-84.3	-95.6	-88.9	0.012
-60	-60.4	-64.0	off scale	-67.5	0.013

5. EMPHASIS

Test Frequency	Recorded Test Level	Measured Output Level (L)	Measured Output Level (R)
1kHz	-0.37dB	-0.62	-5.3
5kHz	-4.53dB	-5.57	-3.47
16kHz	-9.0dB	-9.44	-9.55

6. SIGNAL TO NOISE RATIO

Track 23 (without Emphasis): -114.0(Lin)/-126.0dB(A)

Track 24 (with Emphasis): -113.0(Lin)/-125.7dB(A)

7. FREQUENCY ACCURACY

19.999kHz recorded test signal played at 19.9996kHz — 0.003% high

8. DIRTY RECORD TEST — Passed all levels

9. BLACK DOT AT READOUT SIDE — Passed all levels

10. BLACK STRIPE TEST — Audible output at 2000 microns

11. VIBRATION OR DISPLACEMENT TEST

Acceleration level 1.5G peak: — No sign of audible aberration

'Exemplary'

In conclusion, the NAD 515 is one of the most outstanding CD players I have assessed. I regard its performance as being exemplary in terms of both its user friendly ergonomic features and objective performance. Although the price appears to be higher than many of the other brands with which it will compete, I believe that the price differential is warranted on the basis of its superior performance. ❖

NAD 515 CD Player

High end player measuring 435 x 380 x 106mm (W x D x H), and weighing 7.0kg.

Good points: Exemplary performance, in virtually every respect including vibration tolerance. Has digital output as well as standard high-level analog.

Bad points: Nothing significant.

RRP: $799.

Available: Audio Products International, 67 O'Riordan Street, Alexandria 2015; phone (02) 9669 3477 or 1800 642 922, fax (02) 9578 0140.

PANASONIC'S NV-DS5 DV CAMCORDER

Panasonic has recently released two impressive new digital camcorders which team a single-chip CCD sensor with the DV format, to deliver image and sound quality way ahead of traditional analog camcorders. Here Barrie Smith draws on his many years of experience in the motion picture and video industry, to give us a critical evaluation of the high end NV-DS5 model.

by BARRIE SMITH

One could be cynical about the stunning technology in the 6.35mm DV (Digital Video) format, and suspect the Japanese set out to design ever-diminishing packages containing ever-increasing sophistication at ever increasing prices. But putting such cynicism aside, two cameras were made available on loan to this reviewer from Panasonic Australia — the NV-DS5 and its lesser specified and cheaper brother the NV-DS1. The pair are only the second and third models the company has released in the consumer DV format, following on from the initial and somewhat unhappy three-CCD DX1 model, which was blighted by a quality-sapping image stabiliser. This review will cover, in the main, the DS5 unit.

Industrial designers appear to be getting the upper hand in the Japanese electronics industry. The new camcorder is most attractively presented, with the limited number of external controls ideally placed for both large and small hands. The first surprise is to find the entire left side swings out to reveal a 100mm LCD colour viewing screen, flanked by a 20mm speaker.

Panasonic have followed on Sony's pioneering wisdom in pursuing a twin viewfinder configuration. The undeniably large LCD screen is marvellous for shooting at arm's length or for previewing footage, but diabolical as an outdoors camera viewfinder — the unshielded liquid crystal display just can't cut it against even subdued exterior light. However by supplying a conventional turret-type finder (also LCD colour) atop the camera, to which you can press your fevered eyebrow, all can be seen — whatever the ambient light.

The Digital Video format has won many friends around the world, and consumer cameras are frequently displacing professional analog units in a whole range of professional broadcast applications — not the least of them being deployment in high mobility, high risk news gathering activities.

It's impossible to argue with the con-

cept, especially as expressed in these two new devices. With either you can shoot high quality vision, accompanied by PCM 16-bit (48kHz) channel stereo or 12-bit (32kHz) four channel sound — two channels for the original sound, and two to dub to. Then you can dump the recorded material to another digital recorder or video editing computer system, and lose no perceivable quality in the process. Although a 5:1 compression algorithm is applied in recording, there is virtually no quality lost in multiple dub generations.

Image stabiliser

Both cameras are equipped with an electronic Super Image Stabiliser, which effectively 'floats' a steady picture from within a somewhat larger pixel array in the CCD. This is by far a superior system to the one deployed in the earlier DX1 model, which used technology from Panasonic's first stabilised camcorder, the NV-S1 — circa 1990. The earlier approach carried the penalty of a 15% reduction in image size, and noticeable quality loss when the stabiliser was switched in; the current scheme makes no change to the image size and maintains quality.

On the DS5 the stabilising system works well, aside from the annoying habit of halting and prolonging (respectively) the start and end of any panning action with the camera. Mind you, the electronic image stabilisers from other manufacturers perform similarly.

However, once you forgive this glitch you'll concede that a steady image is virtually worth any price. In most situations it obviates the need to carry a tripod, even when you're shooting with the zoom set to the bump-provoking full telephoto end of the range.

No free lunch

For its part, the zoom lens has a 10X range of optical magnification abetted by a 2X digital boost, making it effectively a 20X zoom. As if this were not enough, a further 'turbo' digital boost can be switched in to create a 100X zoom!

Wonderful, you may say, but like everything in life, there is no free lunch when it comes to image quality. Viewed on a quality 68cm screen you can 'get away' with carefully shot footage captured at 30X (10X optical boosted three times), but after that the image quality is truly unusable, with the whole screen occupied by vastly over-enlarged pixel clumps. A 100X zoom may look great in the ads — but not on the home tele!

Having said that, there may be occasions where it might give you the opportunity to catch special action close up, pulled in from unavoidably distant vantage points.

The two LCD screens are as mobile as one could wish. The swinging-door job can be rotated through 270° in a vertical arc, so you can view yourself whilst shooting. The smaller turret LCD moves through 90°, and the eyepiece is adjustable for differing eyesights.

Stills, effects

It began a long time ago with video camcorders, but with today's fever over digital still cameras a 'still frame' feature carries more weight. The DS5 is no exception and the unit allows the shooting of single frames (possibly single fields) plus accompanying audio — which occupy seven seconds running time on the tape. Another option will shoot still frames of any length.

In the first flush of owning sophisticated pieces of machinery like the DS5, most amateur video makers fall into the trap of using every bit of flashy image making feature available, so that early video efforts can be painful exercises in 'what not to do' with a video camcorder! Unfortunately, camera designers (and I suspect the marketing gurus, panting closely behind them) pander to this phenomenon and pack all sorts of wonderful gadgetry into the tiny packages.

Once the zoom has been worked to death, novice cameramen then discover the array of digital picture effects frequently slipped into even budget video models. And here again the DS5 is no exception: the clever device allows you to wipe or mix between scenes as well as allowing a lift in video gain (for low light work); apply a strobing action effect; a trailing light effect; create a negative image (useful for copying negatives), make a black and white or sepia movie — even impress the neighbours

Brief Specifications — DS5

CCD:	Single 1/3" with 680,000 pixels.
Lens:	F/1.4 10X zoom, 4.7-47mm.
In/outputs:	DV terminals (IEEE1394 compliant); S-video and composite analog.
Tape speeds:	SP approx 18.83mm/sec; LP 12.57mm/sec.
Dimensions:	Approx 78 x 95 x 132mm (WHD).
Weight:	Approx 750g with battery and tape.

with pseudo solarisation.

Significant control

Surprisingly for such a tiny package, the parameters for focus, lens aperture and even shutter speed (1/50 - 1/8000sec) can be adjusted to very fine tolerances, allowing supreme control of the recorded image. All you need is an understanding of what the heck you're doing and a little patience, as you grapple with the finder's menu display.

White balance can be adjusted, either by selecting one of two presets ('Tungsten lit interiors' or 'Daylit exteriors') or by manually setting to the prevailing illumination.

Lithium-ion power

Thankfully, the days of NiCad batteries appear to be over. Those unlamented cells offered little but unreliability and the infuriating 'memory effect', defeating even the most patient recharging routines. The DS5 is sold with a small (7.2V/1250mAh) lithium-ion battery which, even in harsh hands, permits 70 minutes of continuous recording. Other batteries can supply up to 330 minutes of shooting time. An AC power connector is supplied and operation direct from a 12V car socket is possible with an optional adaptor.

Capable flexibility

The DS5 camcorder is not only immensely capable but offers the experienced videographer high-level control of its various modes. Externally, the device is fairly clean: buttons and sliders for power on/off, camera/replay option, zoom wide to tele, backlight and manual focus, plus the essential replay modes (play/rewind/fast forward) are sprinkled across its surface. There is a pressbutton enabling single still frame shooting. Added to this are the various releases for tape loading and battery.

It is only when you access the viewfinder menu system (displayable on either screen) that the full degree of control appears. For those interested, there are the options of applying a wind-cut filter to improve the sound, or using cinema mode to mask the top and bottom of the image frame down to roughly 16:9. Also selectable is a Program AE selection offering special shooting modes: Sports (faster shutter speed for sharp frames in slo-mo replay), Portrait (limited depth of field) and Low Light.

An output terminal box attaches to the camera's base and outputs stereo audio, composite and S-Video as well as a five-pin link to an edit controller. This box will also talk to a video printer, so you can make single frame 'happy snaps' from your video footage.

The flip-out LCD screen also rotates, so you can view it from either front or back. The turret finder also swings up...

There's also an optional kit available which enables downloading of single frames of video to a computer. The camera can also be digitally linked via the Firewire (IEEE1394) protocol to a PC for video editing.

The unit is supplied with an AC adaptor/charger and cabling, lithium-ion battery, card type remote controller, RCA AV cables, S-Video cable, bag and a tape — and the essential link to the outside world, the output terminal box.

Test report

Shooting a colour test chart, the camcorder captured vision with absolute clarity and excellent colour fidelity. I could detect no inter-colour bleeding nor sign of video noise. On test, I could read a half A4 page of 12 point type — so the definition is well within specs.

The sound pickup? Superb quality, as 16-bit PCM should be. The more fastidious will use an external mike with a less global pickup pattern and hopefully minimise the internal buzzes and wheezes which arise from use of the zoom and auto focus; these are common on most ultra-small camcorders and are possibly a byproduct of the mechanisms' proximity to the mike cell (possibly exacerbated by internal resonances within the moulded plastic case).

There is an external mike input, but to monitor its output whilst recording one has to attach the supplied output terminal box, which has a headphone output.

In common with other PAL camcorders on the Australian market (both analog and DV), the DS5 has a line signal output but no input — unlike Sony's PC7. The reason seems to be that some of our PAL camcorders (and presumably the DS5) are sourced from those made for the European and UK market. The EU customs people consider camcorders which allow both line-in recording as well as line-out as equivalent to a VCR, and apply the same duty.

This is rather sad, especially when you consider the marvels of DV format. It means that if you have a DV camcorder and you want to edit the digital signal on a computer, you cannot return the final edit to your camcorder in DV.

I also found the user manual rather disappointing. It's a hard world, they say, but it's even harder when you shell out over $4500 for a piece of gear and you get a 184-page manual which is shared between four languages (English, Japanese, Arabic and Russian) in side-by-side columns. ❖

Panasonic NV-DS5

A compact, high performance digital camcorder using the DV format and fitted with a 10X optical zoom lens with digital enhancement to 100X.

Good points: The superb image and sound quality of DV format, large swing-out LCD screen in addition to turret viewfinder.

Bad points: Cluttered and over complex viewfinder menu options.

RRP: The NV-DS5 is $4599. Its lower-spec brother the NV-DS1 is $3499.

Available: Panasonic dealers. For details call Panasonic's Customer Care Centre on 132 600.

MANAGING THE DATA TORRENT FROM ESO'S VLT

Soon the first of four 8.2m telescopes which will form the European Southern Observatory's Very Large Telescope (VLT) will be completed, and ready to be operated remotely by astronomers on the other side of the globe. The ESO has had to develop a new 'Data Flow System' to manage the enormous flow of data from the VLT — measured in gigabytes per night.

by GEOFF McNAMARA

Advances in telescope size and design in recent years have combined with a corresponding increase in the efficiency of detectors (now capable of sensing almost every photon, at a bewildering range of wavelengths) to create a data overflow. The problem is exacerbated by growing demand by astronomers on increasingly disproportionate number of available telescopes.

Since the Very Large Telescope (VLT) will be the largest, and so one of the most productive, telescopes in the world, ESO had to invent a way of maximising the VLT's data handling efficiency.

What ESO came up with was a telescope management and processing system called the VLT Data Flow System. The system is designed to manage the whole process of gathering astronomical data, from scheduling to archiving observations.

The usual system is an astronomer at a remote site (their home institution) forwards a request for telescope time to an observatory. If the observatory's time allocation committee considers the observing proposal worthy of telescope time, the astronomer is allocated a certain number of nights, or parts thereof, at the observatory. The astronomer then visits the observatory on the appointed night(s).

Time is the deciding factor from here on: no matter what the sky is like — steady, turbulent, even clouded — that's what the astronomer has to put up with. Once the observations have been made, the astronomer returns to their home institution to begin the (often lengthy) process of data reduction.

The Data Flow System improves the efficiency of this system in many ways. The system begins by scheduling observations according to where objects are in the sky at different times of night and year, which filters and instruments are required and how long the telescope is needed (exposure time). This is similar to what is done now, but the new system does it automatically.

ESO's New Technology Telescope at La Silla in the Chilean Andes, which has been used to test ESO's new VLT Data Flow System. (Courtesy European Southern Observatory)

The Data Flow System also takes into account prevailing weather conditions on the night — some observations can be carried out under less than ideal conditions, while others require pristine skies. If the weather changes, the schedule can be changed automatically so that the telescope remains productive for as long as possible.

During a night, the software will point the telescope, collect the data or image, process it and forward the results on to the astronomer while writing a copy to CD-ROM for archiving.

The Data Flow System was tested earlier last year using ESO's 3.5m New Technology Telescope at La Silla in the Chilean Andes. The New Technology Telescope is one of the most advanced telescopes in the world and is used as a test bench for new technologies being developed for the VLT.

During the February 5 test, astronomers at the ESO Headquarters in Germany transmitted via satellite a request for observations to the New Technology Telescope. The software guided the telescope to the correct position on the sky and then activated the telescope. Minutes later, a processed image of a distant galaxy appeared on the monitors back in Germany.

The whole process was carried out automatically, the first time that a ground-based telescope had been operated under the Data Flow System. The successful test of the Data Flow System was an essential step towards the start up of the first VLT telescopes this year.

(Geoff McNamara is a freelance science writer based in Sydney, and a frequent contributor to EA.) ❖

VIRTUAL PC: WINDOWS ON A MAC

Owners of late-model Apple Macintosh computers can now enjoy — or at least explore! — the world of Windows, thanks to a new software package called *Virtual PC*. Here's a hands-on test report, from a long time Mac owner/enthusiast...

by BARRIE SMITH

Using *Virtual PC* is a little like it used to be crossing from West Berlin to the Eastern Zone — it's a little tentative, somewhat tricky and you feel you're doing something wicked and impermissible, as you cross from the macrocosm of Macintosh to the world of Windows. But once you have actually accomplished the journey, unwanted concern soon fades.

Working a Mac as a Windows machine has of course been done before, with such software as Soft Windows, but *Virtual PC* takes matters further. So why would you want to do it?

There are many applications in Windows that are attractive to Mac users and, of course, there are mountains of lower priced peripherals that the Macaholic would love to access — printers, modems, digital cameras etc.

Getting your mind around the situation of having two systems running on the same monitor, shared on the same disk drive and driven by the same keyboard and mouse takes a little getting used to — however, installing the Windows software took little effort. You are supplied with two CDs (one is a full copy of Win 95 and its instruction book) and lucid documentation.

I used a Power Mac 8600, and on this it took little more than three minutes for the Windows software to install onto a newly created 260MB of disk space; this was entitled Drive C. The whole Windows package is then accessible from the Mac Finder, so files can be copied between the two environments. You have the choice of setting up a Windows 95, 3.1 or DOS environment.

Talents & facilities

Let me itemise what I was able to do with this newly converted 'MacWindows' device.

The 8600 Mac (with 32MB of RAM and 2GB of disk space) has an integral CD-ROM and Zip drive. In Windows I was able to play audio CDs from the CD drive; the Sound Blaster driver and associated files are part of the software install.

I was also able to access and enjoy a bundle of Windows 95 games I have acquired over the last few years.

Bravely inserting a Corel WordPerfect Suite 8 CD-ROM into the drive, I then loaded up the Windows version of this fine software. I found that Drive C was nearly full, so I created a new drive, Drive D of 200MB, onto which I loaded the 100MB of WordPerfect files.

Being a Mac operator for nearly 10 years now, it pains me to admit that installing software onto the Win platform was entirely painless — as easy as on the Mac side!

Testing time

Having managed this far without pain, I then set about to open the various WP components — the word processor of course, Quattro Pro, Presentations and Photo House. All worked quite happily.

Next test: I created a text file — using Times Roman and Helvetica fonts — in my Mac version of Microsoft Word (an oldish version 5.1, the one that works!). This was then saved three ways: in Word V3.0, in RTF (Rich Text Format) and as a simple ASCII text file.

These files were copied over to Drive D. Then firing up the Windows

version of WordPerfect 8 I opened the word processor. I experienced no luck with the Word 3.0 file, but managed to open the RTF version, complete with correct fonts and point sizes. And of course the ASCII file came through loud and clear, but without font fidelity of course.

Then, becoming more confident, I hooked up a Windows peripheral — a Kodak DC25 digital camera. This device is supplied with both Mac and Win installation software and cables. Using the Win side of the package now became a serious challenge, as the two platforms have quite different port connectors and cabling...

The camera's Win cable is a mini DIN type at the camera end feeding to a DB nine-pin serial at the other. The problem was how to get this nine-pin data stream into the Mac, which uses DIN plugs and jacks for its serial ports. By digging around I scavenged a DIN Mac serial plug to 25-pin cable from my modem, then joined this to the nine-pin plug, with the help of one of Mr Tandy's wonderful $9.95 adaptors.

Back to the MacWindows. In *Virtual PC* I managed to assign one of the Mac's serial ports (normally used for modems and printers) to become a COM1 port. At this point I have to admit I enlisted the help of distributor Firmware's magic tech support people to get me up and running. Of course, the info was already in the instruction book, but I had missed it. The old story: if in doubt, read the instructions!

Opening the camera's software I was delighted to find that the Windows computer recognised the camera and I was able to download the pictures held in its memory.

The Windows 95 splash screen: very familiar to Wintel users, but not often seen on a Mac!

Virtual PC

A software package which simulates a DOS, Win 3.1 or Windows 95 environment on a Power-PC based Macintosh system.

Good points: Easy to install and configure, provides a surprisingly powerful 'virtual Wintel' machine.

Bad points: Parallel and SCSI devices like Zip drives are not recognised by the virtual machine. Only runs on a 603e/180MHz or better.

RRP: $299.

Available: Firmware Design, 28 Coombs Drive, Penrith 2750. Phone (047) 217 211.

I consider myself 100 pegs below a novice in the Windows environment, but after a day or so I was up there with the best, navigating around the two mounted drives and the CD player. One gap in my knowledge was how to capture screen dumps in Windows; no probs — simply capture them *a la* Mac! which is how the ones used in this story were created.

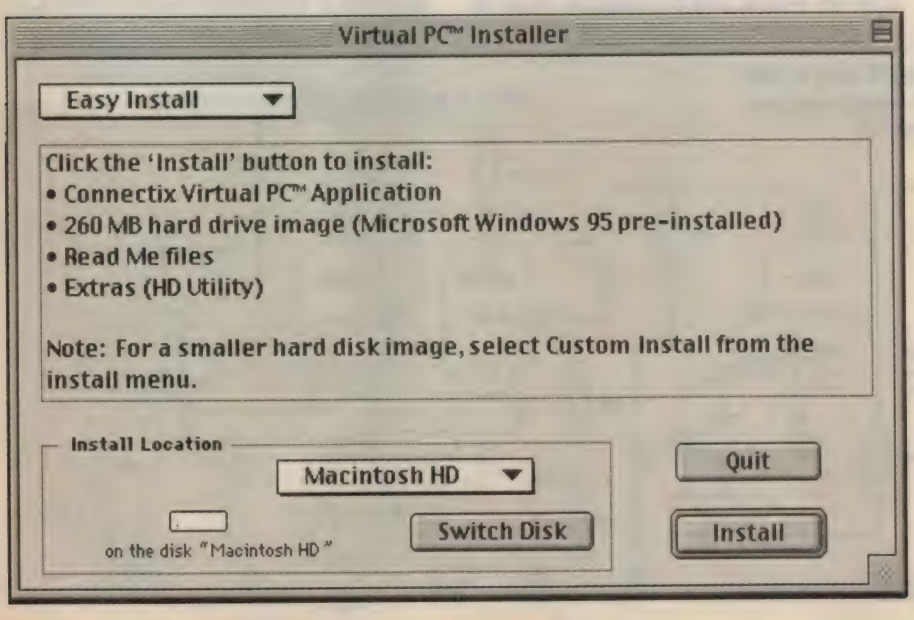
And more?

If *Virtual PC* seems to represent a silver bullet for all those who need dual-platform capability without the need for an expensive two-box solution, the simple answer is that yes, it does.

According to Firmware most serial devices, such as printers can be driven by the MacWindows. One printer can be shared by both system environments. However, there are a few limitations; for example I failed to find the internal Zip drive in Windows. I understand that parallel and SCSI devices will not be recognised by the Windows side.

By the way, *Virtual PC* uses components from the Intel Pentium MMX instruction set, Sound Blaster Pro and S3 video. It also recognises Mac peripherals like Ethernet, CD-ROM, printer and modem as PC devices.

The recommended hardware configuration is a Power PC-based Mac system with a Power PC 603e (180MHz minimum), 604 or 604e processor (any speed). To run Windows 95 on the virtual machine, they recommend 32MB of physical RAM and 300MB of hard drive space. ❖



The Virtual PC Installer window: very easy to use.

KIT FOR VALVE AUDIO ENTHUSIASTS

Encouraged by the resurgence of interest in valve audio over the last couple of years, Sydney firm Valve Electronics has sourced all of the necessary components and released a new valve-type stereo amplifier kit. The KTS30W is especially suitable for today's audio enthusiasts keen to discover why many of their valve-era counterparts had such a high regard for husky output triodes used in the single-ended 'Class A' configuration.

by JIM ROWE

Back in the 1960s, the long established valve-based equipment quietly gave way to the new solid state replacements with their lower power dissipation and other advantages. In the audio area, it didn't take long for most people to realise that transistor amplifiers were offering higher output, wider frequency response, lower distortion and so on, as well as smaller cases and generally much cooler operation. By the mid 1970s virtually everyone had junked their trusty valve amplifiers, or relegated them to the storage cupboard.

But as these things often do, valve technology passed through its nadir and began to rise again in popularity — partly due to nostalgia, perhaps, but also due to curiosity on the part of many people who grew up after valves had faded from the scene. In particular many of today's audio enthusiasts seem curious to find out why an earlier generation of 'golden eared' music lovers were so keen on amplifiers using husky triode valves in the output, and operating them in the relatively inefficient single-ended Class A configuration.

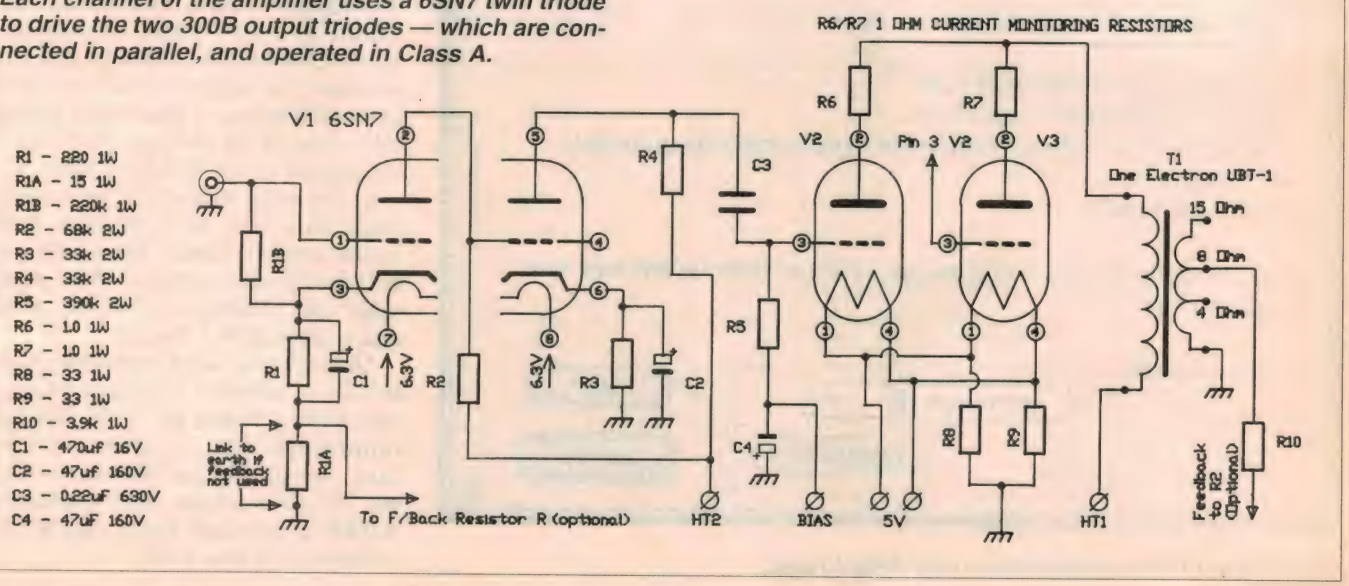
Have I lost you already? Sorry, let's explain some of that jargon. First of all, triode valves are those with essentially only three electrodes: a filament or indirectly-heated cathode, which acts as a source of free electrons; a grid or control electrode, used to control the flow of those electrons by means of a negative voltage; and a plate or anode, which has a positive voltage applied to it to attract the electrons. All of these electrodes are housed in a glass, metal or occasionally quartz envelope (hence the old slang term 'bottle'), which in most cases had all of the air evacuated to form a fairly hard vacuum. (Explaining the alternative term 'vacuum tube'.)

The triode was the first type of valve capable of reliable amplification. Many of the later types of valve had additional 'grid' electrodes, such as the tetrode with its *screen* and the pentode with its *suppressor* as well as the screen. These additional grids generally improved valve performance in various respects — voltage gain, frequency response, power output and so on. But they also tended to increase valve output impedance, which is one of the main reasons why 'golden eared' audio enthusiasts tended to prefer triodes: with a lower output impedance, they provided better damping for the loudspeaker.

Just as with bipolar transistors and MOSFETs, valves can be operated in one of a number of modes, offering different compromises between performance and energy efficiency. Virtually all *low power* linear amplifier stages are operated in 'Class A', where the grid and plate voltages are arranged so that plate current flows at all times — merely varying up and down in level to convey the signals being amplified.

Class A gives the most linear amplification, but requires that the valve must be operated at a quiescent current level high

Each channel of the amplifier uses a 6SN7 twin triode to drive the two 300B output triodes — which are connected in parallel, and operated in Class A.



enough to ensure that the valve doesn't cut off on negative signal peaks. This means that an *output stage* operating in Class A tends to be quite inefficient, and run quite hot even when it's not handling any signals.

To reduce amplifier efficiency and reduce heating, valve amplifier designers soon came up with output stages which operated those valves in modes like Class AB or Class B, where the valves are run at significantly lower quiescent current and power levels. But because these modes result in the valves 'cutting off' for some of the signal cycle, these output stages really have to use multiple valves in a balanced 'push-pull' configuration, arranged so that one valve can take over when the other is cut off. (Most solid state amplifiers use push-pull output stages for exactly the same reasons.)

Of course push-pull operation tends to introduce its own complications, including the difficulty of achieving exactly balanced operation and of minimising 'crossover distortion' when each valve is taking over from the other during the signal swings. So at least some of the 'golden eared' audio enthusiasts in the valve era preferred not to use anything other than a single-ended (i.e., not push-pull) output stage, and operating in Class A.

Needless to say the true believers preferred to combine this single-ended Class A approach with the use of triodes as well, to ensure the lowest output impedance. To get a decent output power this generally meant the use of fairly husky output triodes like the 2A3, or for those who could afford them the famous Western Electric 300B, developed in the 1930s for use in cinema sound systems. If they wanted more output than a single output valve could provide, they used multiple valves in parallel...

By tradition this type of valve amplifier delivered 'clean' and subjectively very satisfying sound — especially when coupled with a fairly efficient loudspeaker system. Although it was not easy to provide much negative feedback, due to the limitations imposed by the output transformer, the low output impedance of the output triodes gave fairly good control of loudspeaker 'nasties', and the single-ended Class A configuration gave relatively low distortion — which consisting mainly of the second harmonic, sounds relatively 'harmonious' anyway.

'Valve sound' kit

It's the renewed interest in 'valve sound' among today's hifi enthusiasts which has prompted Andrew Kay, owner of Sydney firm Valve Electronics, to develop a kit for this very kind of amplifier. Andrew has been working with valve equipment for quite a few years, and started restoring, selling and trading valve radios under the 'Vintage Wireless Radio Company' banner in 1991. Since then the business has gradually changed, and gradually focussed more and more on repairing, upgrading and trading valve-based audio amplifiers.

The company's kit and component operations have evolved more recently, in response to demand. Nowadays Valve Electronics is offering a range of stereo and mono valve amplifier kits, along with an impressive choice of new valves, output and power transformers, valve sockets, filter chokes and other valve-era components that have become harder to obtain — plus a range of valve data books.

The new KTS30W kit provides a way to build a full stereo version of the kind of amplifier that valve-era audio perfectionists would have wanted, assuming they could afford it (and few of them could, in reality). On a generously-proportioned 80mm deep aluminium chassis (or the brushed brass plate and polished wood plinth shown, which is a higher-priced option), it provides two amplifier channels, each with a 6SN7 twin voltage amp triode driving a pair of 300B power triodes in parallel (see basic circuit).

The first section of the 6SN7 (V1) is the input stage, with the amplifier's line level input fed directly to the grid and

the negative feedback signal from the output fed to the cathode (across resistor R1A). The amplified difference signal at the plate of this stage (pin 2) is then directly coupled to the grid of the second half of V1, where it receives additional voltage amplification. The resulting signal from pin 5 is then coupled via C3 (the only capacitor in each channel's signal path) into the grids of the two 300B output valves (V2 and V3).

The output valve plates are combined via low-value resistors R6 and R7 (to ensure stability, and also allow convenient current monitoring), and then connected to the HT supply via the primary winding of the output transformer T1. This is a carefully designed wideband coupling transformer, with a tapped low impedance secondary to allow optimim matching of the amplifier into different speaker impedances.

As you can see the negative feedback is taken from the 8Ω secondary tap, and fed back to the input stage cathode circuit via resistor R10. The overall voltage gain of the amplifier from input to 8Ω tap is therefore (R10 + R1A)/R1A, or about 260.

Note that each of the voltage amplifier stages uses cathode current biasing (via R1/C1 and R3/C2), while the output valves have adjustable fixed bias. The latter allows the user to select the best compromise between power output, distortion and power consumption.

Measured performance

All measurements taken with an 8Ω load:

Power Output vs Distortion
Total Harmonic Distortion (**THD**):

14.5W	11.5% at 1kHz
10W	6.0% at 1kHz
	6.7% at 100Hz
	7.4% at 10kHz
1W	0.4% at 1kHz

Intermodulation Distortion (**IMD**):
(50Hz and 7kHz in 4:1 ratio)

10W	27%
5W	10%
1W	1.4%

Bandwidth
15Hz to 26kHz +0/-3dB
Noise & Hum
-75dB below 10W output
(mostly 50Hz/100Hz artefacts)
Output Impedance
Approximately 5.6Ω
(100Hz - 10kHz, 10W)
Input Sensitivity
200mV for 10W RMS output.

The power supply uses all solid state components and a large power transformer, with a single HT bridge rectifier feeding the two amplifier channels via individual filter circuits — each with its own filter choke, resistors and capacitors. A second small power transformer is used to produce the bias supply for the output valves, with each channel adjusted via a preset pot.

The rated performance for each channel of the KTS30W is quite impressive. Power output is 14.5W RMS into 8Ω at 1kHz, with a power bandwidth (-3dB) of 15Hz - 17kHz at 10W output. The rated THD at 10W output is below 7%, with hum and noise 70dB below 10W with the input shorted. Input sensitivity is 170mV RMS for 10W output (1kHz), and input impedance is 200kΩ (essentially R1B). This means that the amplifier can easily be fed from a CD player via a simple passive volume control system.

Thanks to the Class A output stages, the power consumption of the complete KTS30W stereo amp is around 250 watts. It's not going to make much of a contribution to conserving energy, to be sure — but on the other hand it'll help warm your listening room in winter!

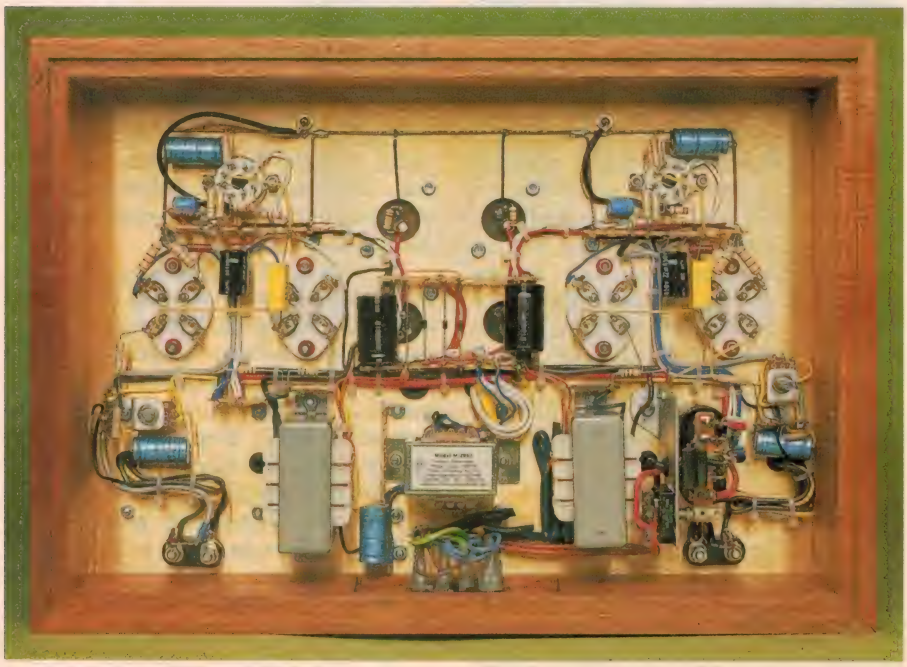
Trying one out

Andrew Kay of Valve Electronics very kindly made a built-up KTS30W amplifier available to us for a few days, so that we could carry out some testing and also hook it up for listening sessions. The sample amplifier is shown in the photos; it included some of the available options, including the brass plate/timber plinth and DC powering of the 300B filaments to minimise hum.

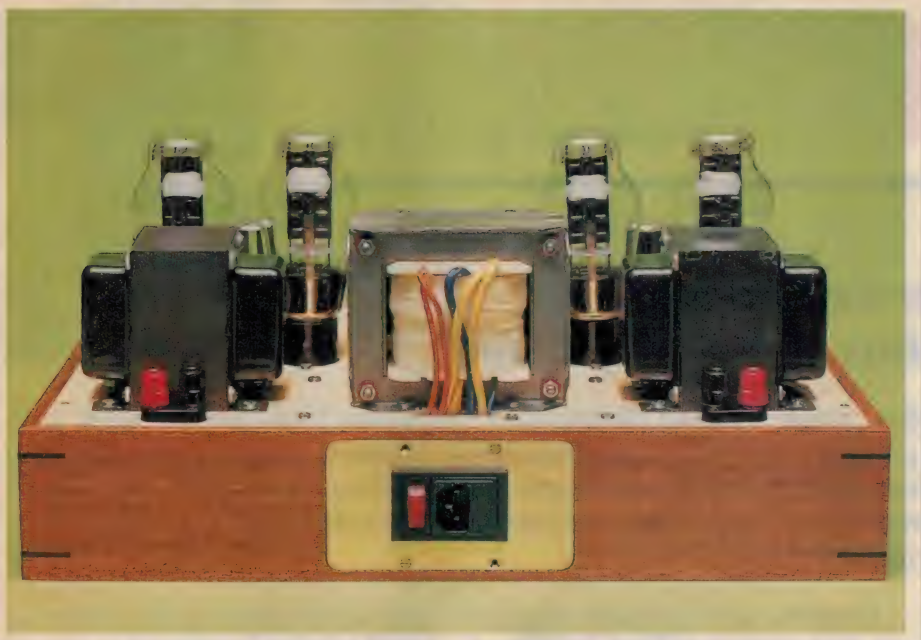
As it happens, the unit was delivered on a Friday and I was able to spend quite a few hours listening to it that weekend, before we made any measurements. For the listening session I fed its outputs to a pair of efficient speaker enclosures, and fed it with signals from my Sony CD player via a 'passive control unit' — essentially a high-quality ganged volume control pot with a stereo input selector switch, in a shield box.

I played familiar tracks from many CDs, covering a wide range of programme information (although mainly classical, which is where my tastes tend to lie). And frankly, the KTS30W sounded very clean and 'sweet' indeed — especially on less complex material such as solo voices or instruments, chamber groups and so on. The only times that I could detect a small amount of 'edginess' due to intermodulation distortion was on loud passages of fairly complex material, such as a full choir and orchestra at 'full tilt'.

In short, an extended listening session with the amplifier was very pleasant indeed. There was very little of the cumulative 'tiredness and irritability' which



Underneath the chassis, everything is wired neatly in the old-fashioned way. The kit includes high quality valve sockets, tagstrips and other fittings.



A view from the rear, showing the mains input and power switch — and the speaker terminals, just behind their respective output transformers.

have occurred after listening sessions with other amplifiers (including some using much more recent technology).

After the listening session I brought the amplifier back to our lab, where *EA* technical editor Rob Evans ran the instruments over it, to see how it measured up against the specification. And as you can see from the table, it basically met the rated figures quite easily. We'd tend to call it a 'twin 10W' amplifier rather than a 'twin 14.5W', but that's largely a matter of preference regarding acceptable distortion levels.

Of course by modern standards, the measured figures don't look all that wonderful — especially those for THD and IMD. But the reality is that in practice, the distortion products generated in this type of amplifier are far less apparent to the ear than those produced by a modern solid state amplifier when it's even approaching these measurable levels (which would be right at overload).

The bottom line is, then, that an amplifier like the KTS30W represents a very good way to experience 'valve sound' in an almost definitive form. And because the KTS30W is a kit, you can achieve this experience with less financial outlay coupled with somewhat more personal satisfaction. There's also a great deal of flexibility, as Valve Electronics can offer a choice of output valves, output transformers and other parts.

The price of the basic KTS30W kit starts at $1140 plus postage, but for those who want something a little less draining on the bank account, Andrew Kay can offer a twin 8W design using parallel 2A3 valves in each channel for a basic price of $940 plus postage. There are also single-channel 'monoblock' kits, offering single-ended 15W (300B) or 8W (2A3) amplifiers for base prices of $685 or $570 respectively, and a push-pull 12W (6BQ5s or 6V6s) design for a base price of only $375.

Of course you can also buy valves, transformers and other parts, to build up custom amplifiers of your own. So if you're interested in exploring 'valve sound', it's well worth contacting Andrew to explore the possibilities. ❖

VALVE ELECTRONICS KTS30W VALVE AMP KIT

Allows construction of a stereo amplifier using twin 300B triode valves in parallel (single ended Class A) in each channel, to give a nominal 14.5W per channel. Includes a husky solid state power supply with the ability to adjust output valve bias levels for optimum operation.

Good points: Low output impedance, flexible way to experience authentic 'valve sound'.

Bad points: Big and heavy, runs quite hot. Relatively low power output for the price, compared with push-pull amplifiers.

RRP: From $1140 plus freight, with exact price depending on options.

Available: Valve Electronics, 239 Australia Street (PO Box 467) Newtown 2042; phone (02) 9557 2212, fax (02) 9516 3981.

FORUM

Conducted by Jim Rowe

Diseases like cancer can be cured with a 555 in a jiffy box — so they claim!

Can you cure serious diseases like cancer, HIV/AIDS, hepatitis, glandular fever and arthritis, simply by hooking yourself up to a pocket sized battery-powered electronic device which delivers a tiny pulsed current of a certain frequency? There are people who believe you can — and what's more, there are firms selling such devices right NOW, in Australia. Currently there's very little anyone can do to stop them, it seems...

My attention was recently drawn to this incredible situation by a letter from a volunteer health care worker and former nurse — who supplied me with her full name and address, but has asked to be identified here simply as 'Cheryl'. I gather the lady concerned was prompted to write to *EA* after she had been in contact with Gary Johnston, the managing director of Jaycar Electronics — for reasons that will emerge shortly.

Along with her letter, Cheryl sent me some photos of some of the electronic devices being sold, plus a lot of supporting evidence and background information. I'll try to extract some of the more salient snippets from this shortly, but to begin with here's the actual letter from Cheryl, which is headed 'Serious Public Health Risks — A Warning for the Electronics Industry':

My reasons for writing to your magazine are many.

Firstly, I would like to publicly express my deep gratitude to Gary Johnston of Jaycar Electronics for his generous donation of $2000 to the Australian Skeptics on my behalf, to assist in locating the victims of potentially dangerous electronic health practices.

Secondly, I wish to join with Gary in warning members of the electronic industry that their products, components and company packaging could be re-used by businesses 'inventing', 'researching', manufacturing and marketing (even exporting) electronic health devices impressively touted as treatments and cures for all diseases, including life-threatening ones such as cancer and AIDS.

As a former nurse I have worked as a volunteer support carer to sick, dying, disabled and bereaved people for many years and have become increasingly concerned about the rapidly expanding unscientific sector of the electronic health industry in Australia — and the potential for these devices and practices to dangerously exploit sick and dying people, including children. When these practices involve infectious diseases they also place at grave risk the health and lives of contacts.

Jaycar Electronics' packaging, with the 'car' blacked out, was re-used by the supplier of a $105 (mail order) 'low frequency generator' promoted as a cure for cancer, AIDS, all infections, MS, diabetes and so on... A bio-medical engineer has found the device delivers a small current from 7-8 volts. Basic instructions on how to build the device are on the Internet.

A highly reliable source has informed me that personal, walkman size RIFE audio-frequency therapy units are also being made "from $40 generators obtained from electronic stores, con-

Above: An 'exploded' view of one of the Satvic devices, as received by 'Cheryl' — you could buy the parts for less than $15. Right: Another Satvic unit in its 'recycled' Jaycar packaging, plus Dr Clark's modest little book...

verted and then re-sold for hundreds of dollars". The RIFE machine was invented in the USA in 1930's as a supposed cure for cancer and all pathogens.

Any suburban electronics 'expert' can set up a business building such devices — re-using other companies' products — and provided they adhere to certain advertising restrictions, have the device Listed on the Australian Register of Therapeutic Goods (ARTG) — a seriously flawed process which requires no proof of efficacy, but which gives the devices enormous credibility.

I have enclosed some photos of one type of device — in the hope that readers may identify the products; they appear to be part of a child's electronic toy. If anyone has any information could they please write to the Australian Skeptics, of PO Box 268, Roseville 2069.

Professor John Dwyer, Dean of the Medical School at UNSW and a world renowned immunologist and AIDS researcher, was keynote speaker at the Australian Skeptics' National Convention on August 9th 1997. He showed the audience the 'Jay... Electronics' cancer/AIDS device and expressed his deep concerns about these and many other pseudo-medical diagnostic and treatment devices now flooding the health market, and the urgent need to protect health consumers with public education and protective legislation.

Bravo Gary Johnston and Jaycar Electronics, for demonstrating their concerns for less fortunate people in our society, who just happen to be sick and desperately searching for a cure.

As you can see, 'Cheryl' makes quite a few points, and some of them probably need some further explanation for those of us who are relatively new to this area. I'll try to do this shortly, but in the meantime you might like to inspect two of the photos that Cheryl included with the letter. One shows a small rectangular device with what seems to be a picture of the space shuttle on the front, housed in what is clearly a Jaycar Electronics bubble pack (with the 'car' blacked out), along with a book titled *The Cure for All Diseases*. I have since learned that this book was written by a Dr Hulda Clark, who has a PhD in physiology from the University of Minnesota and has also published other books, including *The Cure for All Cancers*. More about Dr Clark and her connection with this kind of device shortly.

The other photo shows another device from the same Australian supplier, opened up to show what's inside. As you can hopefully see, there's a single IC and a few passive components mounted on a small piece of matrix or stripboard, along with a pushbutton switch and a standard 9V battery. This all goes inside what looks to be the smallest standard plastic 'jiffy' box, and is apparently supplied with two clipleads and a pair of short lengths of copper tubing, presumably for use as handheld electrodes.

Bought by mail

Both of the devices shown, along with a third similar unit, were purchased by Cheryl by mail from an Australian firm called Satvic Energy Pty Ltd. The unit which arrived in the 'Jay—Electronics' packaging was sent when she wrote to tell them she was suffering from 'AIDS, hepatitis-B and related lymphoma', and was 'rather desperate'; the second unit was sent when she wrote under another name, and said she needed a device to treat 'a friend's child suffering from leukemia'; and the third unit was sent as a replacement for the second, when she wrote to complain that the latter's case didn't have room to fit the 9V battery.

So what's actually inside these mysterious little boxes, which are apparently

being sold to treat diseases like AIDS, hepatitis and leukemia? Well, Cheryl was curious about this too — so she decided to seek some professional advice, and sent a couple of the devices to the Hunter Area Health Service's Biomedical Engineering Department, based at John Hunter Hospital in Newcastle. Here they were examined and tested by the Department's Director Bruce Morrison and his team of technicians.

Cheryl sent me the contact details for Bruce, who was good enough to both talk to me about what they'd found, and also send me copies of their test results. He also sent me a copy of the circuit they'd traced out for the Satvic devices.

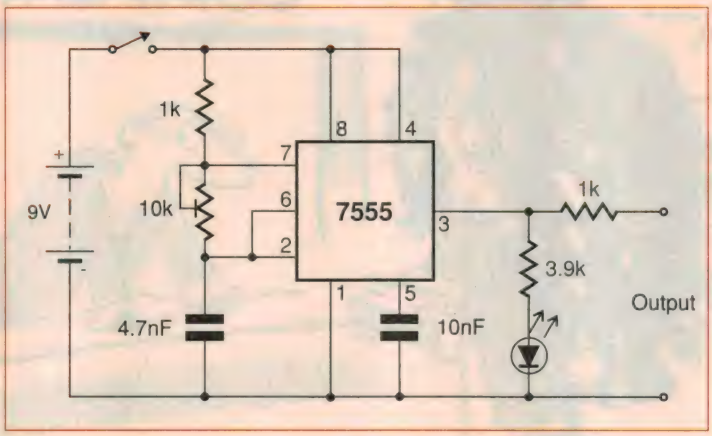
Guess what? As you'd guess from the photos, the circuitry in these devices is extremely simple. In fact it's nothing more than a bog-standard squarewave oscillator using the CMOS version of the ubiquitous 555 timer chip, together with two small ceramic capacitors, a 1k resistor and a 10k preset pot, set to produce oscillation at around 40kHz. The output of the oscillator is fed to a LED through a 3.9k series resistor, and also through another 1k resistor to the 'active' output electrode. (See small schematic.)

So all that's actually inside these Satvic 'magic boxes' is a simple squarewave oscillator running from a 9V battery and able to deliver a chopped signal of about 40kHz, with a peak no-load voltage of a little over seven volts and a maximum current capability of no more than 7mA into a short circuit. Into a load of say a few kilohms (which you might expect from someone holding the electrodes with saline dampened hands), you'd probably get around one milliamp at most.

It's not likely to do you any harm, then, but would it do you any *good* — especially if you're unfortunate to have one of those serious ailments? That's the real question, of course.

I asked Bruce Morrison if he was aware of any credible scientific evidence suggesting that such devices could have any beneficial effect on diseases or illnesses, and his reply was basically "none that I'm aware of!" However he *was* aware of the theories that seem to be generally behind this type of device, which have been promoted by a certain Dr Hulda Clark, in her books.

In fact it turns out that in Dr Clark's book *The Cure For All Cancers*, she gives details of a simple build-it-yourself device for 'killing pathogens', called The Zapper. There's a full circuit and parts list given, together with fairly detailed instructions intended to allow non-technical people to build a Zapper using a cardboard shoe box as the 'case'. And the circuit of Dr Clark's Zapper is virtually identical to that of the Satvic units acquired by Cheryl, and tested by Bruce Morrison's team. The only difference is that a 3.9k fixed resistor is shown instead of the 10k trimpot, resulting in a relatively fixed output frequency...



The schematic for the Satvic devices, as traced out by Bruce Morrison's team at HAHS' Biomedical Engin-eering Department. Using parts worth about $15, it appears to be closely based on the design of Dr Hulda Clark's 'Zapper'...

The gist of Dr Clark's theory seems to be that hanging onto the electrodes of this device with saline-dampened hands, for three seven-minute sessions, will cure almost anything that ails you. This is supposedly due to the fact that the tiny chopped 40kHz signal 'zaps' flukes, roundworms, mites, bacteria, viruses and fungi — which she seems to believe are the cause of virtually all diseases, as far as I can see. She even claims that cancer is caused by 'a certain parasite'.

So the bottom line seems to be that if you believe Dr Clark's theories, as expounded in her books, a small electronic device based on a 7555 chip and with parts which can be bought for no more than about $15 from an electronics store (although they're typically sold for $75 or more) will 'cure' a huge number of ailments — some of them very serious indeed.

Needless to say this belief is not shared by all that many properly qualified medical authorities. As Cheryl notes in her letter, Professor John Dwyer the Dean of Medicine at the Uni of NSW and Sydney's Prince of Wales Hospital (and a well-known immunologist and AIDS researcher) has been quite vocal about his concerns regarding such 'pseudo medical diagnostic and treatment devices'. The Australian Skeptics have also been quite active in promoting public awareness regarding the dangers of such devices — although as Barry Williams of the Skeptics points out, people like themselves representing 'the voices of reason' are facing a rather uphill battle nowadays because "people WANT there to be a quick, painless and cheap cure, and modern medicine often seems to offer only slow, costly and sometimes painful treatments".

You'll find more about the Australian Skeptics and their views on 'electrotherapy' devices on their web site at **http://www.skeptics.com.au**, by the way. It's well worth a look...

Other devices

At this stage I should note that the little 555-in-a-box 'Zapper' type units as sold by firms like Satvic are only one type of 'therapeutic electronics' devices now being marketed. Our correspondent Cheryl included details of a few other types of device with her letter, and the more I've looked around on the Internet/Web for information in this area, the more it's become clear that we're looking at only the tip of an enormous iceberg. (Or perhaps a slightly more appropriate analogy might be that large pile of tricerotops excreta in a memorable scene from *Jurassic Park*, where the woman scientist is trying to determine what might have made the animal unwell!)

For example Cheryl sent material on devices being sold by companies started by, or associated with a former CSIRO geologist called Mr Geoff Baker, who seems to be based on the NSW Central Coast. In a story which ran in the *Newcastle Herald* on December 30,

1993, Mr Baker is shown with a device which looks very much like a standard low-frequency function generator.

The companies concerned are Electromed (Australia) Pty Ltd of Brighton Le Sands, with partners listed as Geoff Baker and Jenelle Aitken, and AFT International of Macquarie Street, Sydney — formerly BWB Geltech, started by Geoff Baker and herbalist Eilleen Whittaker, and later run by Ms Whittaker. Both seem to sell devices for around $1500 - $1650. The AFT device, described as an 'Audio Frequency Therapy Unit', appears to be pocket-sized and apparently comes together with a plug pack supply and two pad-type electrodes.

From what I've been able to learn, it seems that these and quite a few similar 'electrotherapy' devices are based on the work of a US researcher called Royal Raymond Rife, who claimed in 1932 to have discovered a cancer 'virus'. Rife also claimed to have developed a method of curing cancer and other diseases by exposing the viruses, bacteria and other responsible organisms to electronic signals 'tuned' to what he said were their specific resonant frequencies. He apparently published charts showing the specific frequencies (called Mortal Oscillatory Rates or MORs) for each disease-producing agent. According to Baker 2008Hz is for cancer, 2167Hz for leukemia, 55Hz for glandular fever and so on...

It's presumably some of the later people promoting RIFE-type equipment who have determined the appropriate frequency for AIDS (apparently 2489Hz, if you really care), because as far as I'm aware HIV/AIDS hadn't even been identified in the 1930s...

I found quite a bit of information about RIFE-type devices on the Web, at URLs like **http://botree.yourwebhost.net/jwlabs/**, run by an organisation called JWLabs, and **http://www.rrrs.com**, which is run by the 'Royal Rife Research Society'.

Some of the newer 'up market' and 'high tech' devices based on Rife's theories seem to be dressed up with direct digital synthesis for frequency generation, and/or digital counters to indicate the exact output frequency. It all makes them look more impressive, I'm sure.

Yet another kind of device, even more expensive, are the LisTEN and Etre systems, of which the latter seems to be produced by a German firm called Etherapy and distributed in Australia by a firm called Inner Glow Health Products, of Warrandyte in Victoria. This is based on a PC, which is coupled to a special handheld 'ETRE Reflex Sensor' — said to respond to involuntary muscle reflexes in the hand. A program running on the PC asks the subject various questions, and then monitors their 'involuntary reflexes'. By analysing the response pattern the program is then able to diagnose what's wrong with the subject, and suggests appropriate treatments (some of which it can supposedly perform, at a distance).

The LisTEN system, distributed here by a firm called Health Through Technology, is also PC based and seems to use some kind of skin sensor. Its cost seems to be about $34,000, so presumably either the special handheld sensor uses some pretty fancy technology, or the program took a lot of writing, or someone is making a fair bit of profit!

Lots of other gadgets seem to be emerging from the electronic woodwork as well, but by now you probably get the idea. Generally they seem to be based on what is best described as 'alternative therapy' theories, but using electronics and/or computers to give them an appearance of high tech and scientific respectability.

Legal loophole

But getting back to one of the main points made by Cheryl in her letter, how is it that these devices can be legally sold in countries like Australia — when our medical authorities seem to see no real merit in them, and in fact seem to be quite worried about the risks of people putting their faith in them as supposed alternatives to recognised treatments? Aren't there bodies charged with vetting all therapeutic products?

Well, as far as I've been able to find out, Cheryl is right in saying that currently there's a serious problem in this area. In fact there seems to be a legal loophole that you can drive a metaphorical truck through, and the people selling these devices seem to be doing just that.

There *is* an organisation known as the Therapeutic Goods Administration or 'TGA', which does seem to be charged with checking all 'therapeutic' products sold in Australia — from multi-million dollar positron emission tomography scanners right down to $5 packets of bandages, I gather. But it seems there are two different ways of getting goods 'through' the TGA vetting system so they can be legally sold; and it seems that these two ways differ radically in their level of testing...

One way is to go for TGA 'registration'. This involves full testing, not just for things like basic user and client safety, EMC compatibility and so on, but also to ensure that the device or system does in fact perform the functions it's supposed to perform. I gather the testing for this full registration is fairly expensive, and can run to tens of thousands of dollars.

But the problem is that only specific therapeutic products are able to be given this 'full registration' — products like intra-ocular lenses and heart pacemakers. All other products can only be handled the other way, which is the TGA 'Listing' referred to by Cheryl in her letter. This involves testing only for things like basic safety, with no testing of any aspect concerning whether the device or system actually does what is claimed. Needless to say this approach involves far less testing, and is much cheaper — but still allows the product concerned to be legally sold.

Of course this means that the TGA clearly takes *no responsibility whatever* for the efficacy of any product that is merely Listed on its Australian Register of Therapeutic Goods. But the reality is that most people (even many doctors, I understand) aren't even aware of the two levels of testing, and are likely to assume that a Listed product still effectively carries an endorsement from the TGA regarding its efficacy. After all, it says it's been Listed on the ARTG, doesn't it — isn't that just the same as being Registered?

Packaging piracy

Of course the other nasty aspect which Cheryl has brought to light is this business of the Satvic devices apparently being sold in crudely modified packaging from another company — in this case that of Jaycar Electronics. That is pretty sleazy, isn't it? I can well understand that Jaycar MD Gary Johnston would be upset about it, as he has every right to be. It would inevitably tend to give an innocent buyer the impression that Jaycar was somehow involved in developing and/or marketing these products, and I feel sure this is not the case.

I'm no legal expert, of course, but surely there must be some law against this kind of unauthorised recycling of a company's packaging, by another company. I certainly wish Gary Johnston well in pursuing Satvic along these lines, in order to protect Jaycar's reputation.

So that's the situation, which I think you'll agree is quite worrying. My sincere thanks to our correspondent Cheryl, for bringing it all to our attention, and also to Bruce Morrison of the Hunter Area Health Service and Barry Williams of the Australian Skeptics, for their help in preparing this article. I trust we've all given you food for serious thought. ❖

AUTOMOTIVE ELECTRONICS

with JON LOUGHRON Assoc. Dip. Electronics

The Electrajet PC EFI Diagnostic System

This month we take a look at the latest version of the Australian-designed and manufactured Electrojet PC-based auto diagnostic system. It's available in three different versions: a software database/manual, the software plus a manually-connected four-channel scope, or the full-blown 'connect it into the cables and it tells you exactly what's wrong' version...

A few years ago 'Major Al'— the gentleman who first wrote *EA*'s automotive electronics column — covered a test unit that I am going to revisit this month. The latest model of the unit is a PC based system that provides technical information about the electronic/electrical systems on late model fuel injected vehicles. It also has the added advantage of being able to be interfaced to the vehicle and provide feedback for the technician, to assist him/her in making a quick and efficient diagnosis for electronic-electrical fuel injection problems.

Over the years there have been frequent calls from automotive technicians for vehicle manufacturers to provide more information about their particular engine management systems. Often the technician is left with no alternative but to change a component to see if the device is faulty, because insufficient information is available.

I must also say that some workshops which take on a job and they have not completed sufficient training, nor have they purchased the workshop manuals for the vehicle that they are trying to repair. (I can hear the howls of dissent and anger as tech's read that last comment). However I am not trying to lay blame or point the finger. What must be achieved is an equitable compromise, where the information is made available and the technician is also prepared to attend courses, continue with education programs and purchase the relevant technical details.

This brings the typical technician to an interesting crossroads in his/her technical life — do I continue to learn, or do I give up and sell ice creams at the local football matches? This seems quite extreme, but I have heard from many mechanics and technicians that often feel like this, and I can sympathize with them because some of the intermittent faults that I have come across have been enough to turn my hair grey. In fact I am surprised that I still have hair at all!

Two of the elements of the Electrajet diagnostic system are shown here: the software, running in this case on a laptop PC, and the T100 hardware 'toolbox' — which provides the functions of a four-channel lab scope.

So all this preamble is to reinforce the point that technology has radically changed under the bonnet, and therefore the testing procedures and equipment must also change.

Diagnostic 'tune scopes' have come ahead in leaps and bounds. Most late model units have dual-trace lab grade scopes on board, and they are now based around a PC system. (By the way, be very careful when choosing a tune scope, because some are still fairly primitive although they are PC based and claim to be 'real time' and very high tech...)

This brings us back to the subject this month, which is the Electrajet automotive diagnostic system. I was recently in Brisbane, where Electrajet's head office is based, and was fortunate enough to get a tour of the company and an in-depth look at the latest version of their hardware and software system.

T100 and CSM

I earlier referred to 'Major Al' and the fact that he did cover an early version of Electrajet's test station. The latest versions of that unit are vastly different, because it was a complete package in the early days, but now the engineers have come up with a very interesting and practical design. The unit is now based around a standard PC, so as mentioned before if you already have a tune scope that is PC based then this is a real bonus.

It's basically available in three configurations. The software can be purchased stand-alone, which means you get the information package to use as a reference or library on late-model EFI vehicles. You can alternatively buy what I call the stage one package, which includes the software and the T100. The T100 is an interface device which gives the user the functions of a four-channel lab scope (pretty neat). Finally there's the full-blown system, which contains the software, the T100 and the CSM.

The CSM is what makes this product so spectacular, because you can connect the whole shootin' match up the car and it runs through each pin, does a quick comparison to the database and flags any problem pins. The main advantage of this is the fact that you do not need to know any pin numbers or any particular voltages — the unit looks, compares and tells the story all by itself.

This may seem like fantasyland, but before you scoff and switch off, the engineers at Electrajet actually test and load all the information from real living breathing automobiles. Yes — you read that correctly — real vehicles. So the information is not a copy of incorrect information from manuals. (No disrespect intended to vehicle manufacturers, but mistakes can happen with the written word and some manuals *do* have errors!)

Fig.1 shows how the full PC plus T100 and CSM are connected up.

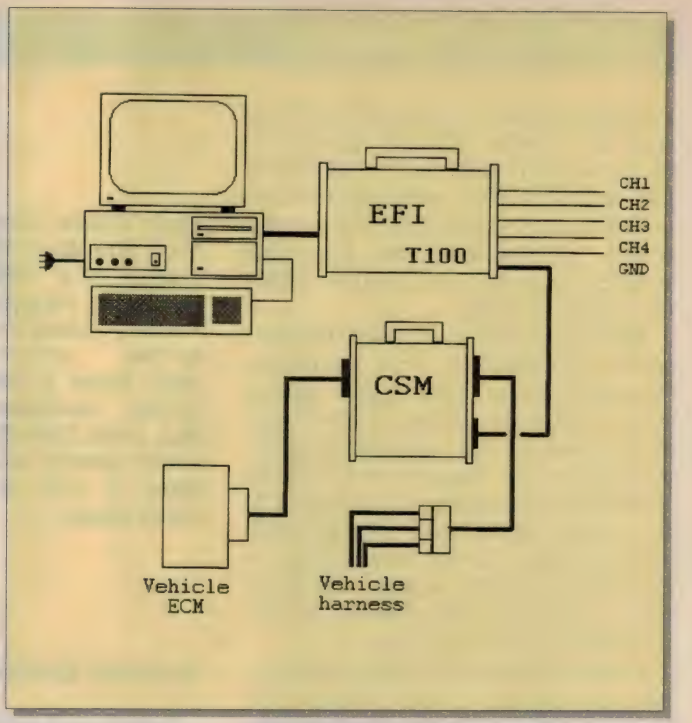


Fig.1: The basic connections for the complete Electrajet system. The T100 connects to the PC, while the CSM provides further connections to the ECM (car computer) and vehicle harness for automatic testing, when it's used.

BMW 318i 88-91 1.8 litre manual transmission				
ELECTRAJET Ranges check: Normal idle, Normal operating temp, All accessories off				
PIN	DESCRIPTION	LOWER	UPPER	UNITS
18	Battery Supply	11.0	14.0	Volts
37	EFI Relay Supply	11.0	14.0	Volts
36	EFI Relay control	0.0	1.0	Volts
3	Fuel pump ground	0.0	1.0	Volts
2	Ground	0.0	0.4	Volts
14	Injector ground	0.0	0.4	Volts
19	Ground	0.0	0.4	Volts
24	Ground	0.0	0.4	Volts
5	Purge control	0.0	1.0	Volts
12	AFM 5V reference	4.5	5.5	Volts
7	AFM input	0.5	4.5	Volts
44	Air Temp Sensor	2.5	4.0	Volts
45	Coolant Temp Sensor	0.5	1.5	Volts
52	TPS Closed Signal	0.0	0.4	Volts
53	TPS Open Signal	9.5	12.0	Volts
4	ISC Valve	30.0	70.0	D/C %
47	Crank Sensor (A)	750	800	Hz
16	Injectors 1&3	3.00	4.50	mSec
17	Injector 2&4	3.00	4.50	mSec
FPS	Fuel Pressure	200.0	250.0	Kpa

Fig.2: The kind of 'range template' provided by the Electrajet system, showing the acceptable limits for voltages on the various ECM pins — in this case for an 88-91 BMW 318i.

Different vehicles

The software at present supports approximately 180 different vehicles, and more are becoming available with each upgrade. This also means that any vehicle found in the menu can also have the hardware attached and therefore tested, either automatically by the CSM or manually via the T100.

When the software is booted the main screen appears. This is the introduction page, and it has the menu selection up the top of the screen. The system is function key (F1, F2 etc) and arrow key driven, which I thought at first was a little prehistoric, but a lot of the automotive workshops are only getting into the PC revolution now — so I don't see it as a major disadvantage. Also it runs from under DOS from Windows quite happily, so there is no major disadvantage.

(The software engineers said very quietly that a full Windows version is only around the corner, but said don't mention it in the article because lots of work still had to be done...)

So once the main menu is entered you have five basic choices:

F1 Vehicle: This gives you the choice of which vehicle manufacturer

F2 License: Enables the software to be licensed to a site

F3 Options: Printer selection and general options (language etc)

F4 Launch: Add new programs to the system

F5 Exit: Get out

F1 is the one that we are particularly interested in, because the other func-

tions are not part of fixing the problem with the vehicle. When F1 is selected the menu for 17 different manufacturers appears and you the select the required manufacturer. That maker's various models are then presented. I selected Ford, for example, and found 47 different models available.

When you choose a model, the next screen presented is very interesting because a picture of the vehicle appears on the left-hand portion of the screen and on the left is a picture with an arrow pointing to the location of the ECM. Sometimes manufacturers put the ECM in a place where only Houdini could find it, so this is a very helpful piece of information. I often receive calls from tech's asking me where the ECM on a particular vehicle is located...

I must also inform the reader that there are two versions of the software. The reason for this is simple. Although they essentially contain the same information, if the user is only going to use the system as a text reference then the interface software and testing software is not necessary because there is nothing to connect to the vehicle. So the information package, which still contains information plucked from the actual vehicle ECM terminals, is called Electraspec while the software that interfaces to the vehicle is called Electrajet.

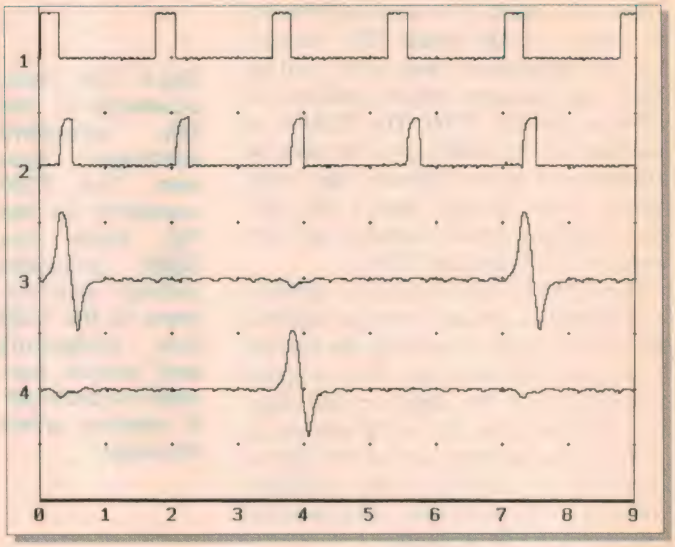


Fig.3: Traces taken from the ignition system of a 1990 Toyota Tarago. Trace 1 shows the igniter control (Igt), trace 2 the igniter feedback (Igf), trace 3 the G2 crank sensor and trace 4 the G1 crank sensor.

Vehicle testing menues

Getting back to vehicle testing, when a vehicle model is chosen another menu bar appears and the selections are as follows:

Library F1: This has various topics which include every sensor on the vehicle selected. It also has topics that include a Diagnosis guide, Basic EFI tutorial, Abbreviation summary, General specifications (ignition timing, idle specs, idle CO), Torque specifications and ECM pinouts (including description).

Ranges F2: This menu provides information about the particular pins and gives the user range information about a device such as an injector, under different engine conditions. The options include Key On Engine Off (KOEO) Idle etc. Fig.2 shows an example of the information available.

Test F3: When the test menu is entered, the user is presented with test topics for each device on the system selected. For example if you were looking to test an Air Flow Meter (AFM) on a 88-91 BMW 318i, the system brings up a picture of where the AFM is under the bonnet, a graphic representation of the AFM and connections to the ECM (with wire colours and ECM pin connections), and also a written explanation of the pinouts including voltages.

Waveform F4: This menu has a library of waveforms taken from vehicles under different operating conditions. Once this option is entered the user can select reference waveforms, scroll the waveform, check injector on-times in milliseconds, output frequencies from Ford map sensors, idle speed frequencies etc.

On the Electraspec version you can only look at the already saved waveforms, but on the Electrajet you can save waveforms from faulty vehicles, compare live waveforms to previously stored values to assist with repairing complex engine management faults.

It also should be remembered that the scope facility has four channels (Fig.3 shows a Tarago ignition system), so comparing different signals is simplified. Also if you think that a particular measurement is important it can be recorded for future reference. So you no longer have to look up reference manuals for details — they are available in the software package.

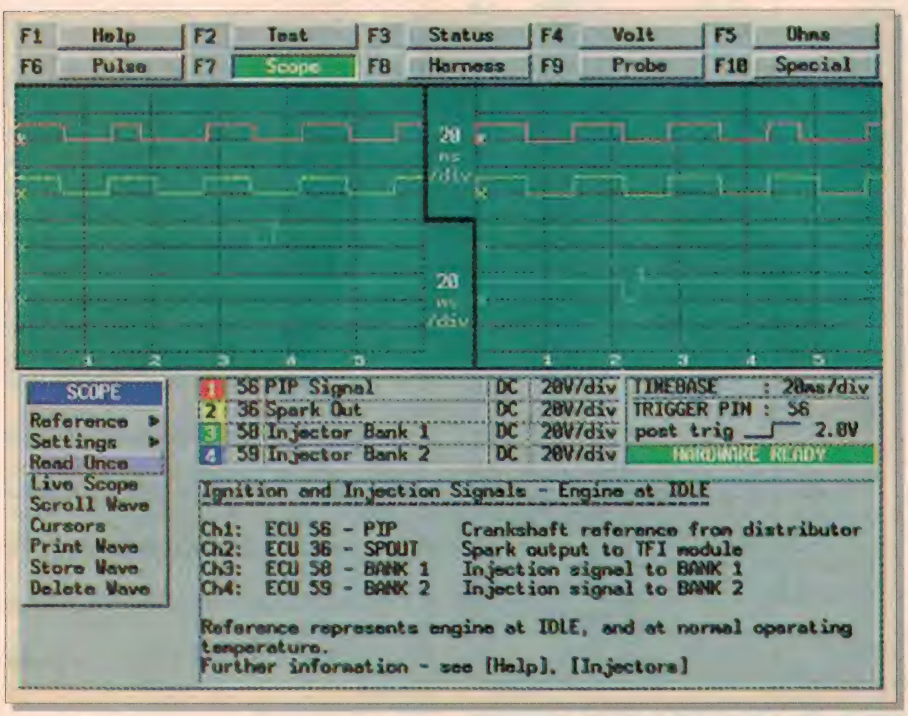


Fig.4: The 'scope screen' on the computer is divided into two sections, with the reference data on the left and the 'live' data on the right.

Other menus give the technician the ability to use a multimeter and various other test functions. So if you have any doubts about a particular circuit, you can investigate it individually and again the relevant specs for the vehicle are available in the test menu.

Fig.4 shows the scope with the left side of the screen showing the reference patterns and the right side the live data.

PC advantage

I mentioned before that the system is interfaced directly to a PC and this makes good sense, because a lot of the late model tune scopes are PC based. This means you may very well already have the hardware available to run the Electrajet (apart from the T100 and CSM).

The software is available on CD-ROM, so it may be necessary to have a CD-ROM drive installed — although the software engineer at Electrajet installed a copy onto my laptop (which doesn't). So it will run from your hard drive, providing it's not an old 20 meg clunker and you are still running an 8088!

Unfortunately diagnostic fault codes are not available on the system, but Jason (the guy who did the demo for me) believed that the power of the machine made the fault code idea a little redundant. He justified this by stating that, because the machine illustrates every pin on the ECM and gives an indication if it is too low (blue) and too high (red) in the range function, this is more than the fault codes do: if a device is open circuit or short circuit a fault code is loaded, but if a system is slightly out of calibration and still within the normal operating range a fault code will not be loaded.

He definitely has a point, because apart from the above fact, I have been misled by codes more than once. But I must say that late-model vehicles have 'learn' parameters available, so that events such as slow O2 sensors and long term fuelling problems can be interrogated via the diagnostic link. Of course this is a little more than just codes...

Overall impression

My impression of these late model Electraspec and Electrajet vehicle test systems is that they have a big future in the automotive test environment. There are other CD information packages around and they have got lots of information about various vehicles, but Electrajet is the only one with the graphics package that shows where particular devices are on the vehicle.

It also comes with the added hardware, an interface to the ECM, provides information quickly about every terminal on the ECM, and has tutorial information and test specifications about all the devices on a selected vehicle.

As I mentioned in the start of the column, technicians need test information and relevant specifications. From the foregoing it can be seen that the Electrajet provides not only a workshop manual for different vehicles and a full-blown test station, but can also be used as a great training aid.

I don't think that tune scopes are under threat from this technology, but I would be more inclined to say that it makes a great complement to any test equipment that you already have.

Perhaps I should also remind you that although this is a great piece of test equipment which tests the ECM electrics, there are still other things that must be tested on vehicles; a gas analyzer and tune scope will always be valuable workshop tools.

The last point before I sign off this month is that the Electrajet equipment is designed and built right here in Australia. For more information you can contact Diagnostic Solutions Pty Ltd, Unit 2, 15 Anthony Street, West End 4101; phone (07) 3846 3393 or fax (07) 3846 3282.

That's it from me this month — 'bye. ❖

INFORMATION CENTRE

by PETER PHILLIPS

Conserving energy, the IrDA interface & reader questions

This month we conclude the discussion on the energy in a lightning strike and examine a range of issues — including how to dispose of ferric chloride and how to shatter glass with an audio signal. Other topics include preserving Super-8 film on video and non-standard UHF channel numbering.

Over the last few issues I've been asking about the energy in a thunderstorm. It appeared to me that the dissipated energy exceeded that used to create the storm, defying the conservation of energy law. I then wondered, given recent experiments concerning the energy contained in water, if there was something going on that needed further explanation. I threw the question over to readers, hoping to get some discussion — which of course I did.

The first letter I presented was from Brian Byrne (Indooroopilly, Qld), who gave some figures concerning the charge in a typical lighting bolt.

I want to present some more letters on this topic, even though I now realise there's not as much energy in a lightning strike as I first thought. That is, my question is no longer relevant. The first letter goes straight to a fundamental point...

Energy conservation

Regarding your question about the energy released by a storm and if it exceeds the energy used to create it, and if so, where does this extra energy come from. The answer to the first part is no, as it would violate a basic law of thermodynamics, in which energy cannot be created nor destroyed, i.e., the energy within the universe is constant. Because the first part of the question is no, the second part of the question need not be answered. (Paul Hetrelezis, Noble Park Nth, Vic)

I guess it's reasonable that you think I'm not aware of the conservation of energy law, Paul. To many readers, my questions may have seemed ridiculous, but I'm one of those people who tries not to regard anything as 'fixed in concrete', even fundamental laws that appear to govern our universe.

For this reason, I question these laws if it seems they don't cover a particular situation. This is what many scientists do. No, I certainly don't regard myself as a scientist, but this doesn't mean I can't try to think like one. But, try this question about the conservation of energy:

It has been proved by Professor Penrose that the energy absorbed by a black hole ends in a singularity, which is a point that occupies zero space. So if this energy is lost to the universe, where has it gone, and what about the conservation of energy law?

Lightning energy

The next letter disagrees with Brian Byrne's figures given in October and throws some light on how a storm develops:

Some time ago I was asked about lightning rods for a local church. My advice was that a 'do it yourself' job was more likely to increase the danger to the building than to reduce it.

In the course of my investigations however, I came to the conclusion that the total energy in a single lightning strike on a structure was around that contained in my breakfast. The devastating effect of a lightning strike is due to the release of this energy in an extremely short time, being around one microsecond.

Mr Brian Byrne says in your column that: "Quantities of charge are around 5 to 20 coulombs, with an ultra-rare value up to 200C." I am somewhat puzzled by these values because a coulomb of unbalanced charge is an extremely large amount of electricity. One coulomb spread uniformly over the surface of the earth would alter its potential by some 1400 volts.

This suggests that the '5 to 20 coulomb' refers to the total charge carried by the cloud bank as roughly equal positive and negative charges generated by what we called 'frictional effects' in my schooldays, and separated by the powerful updraughts which generate the towering thunderheads of storm clouds. The charge involved in any single lightning strike to ground would be more like 5 to 20 millicoulombs.

The generation of the charges probably requires much less energy than the large scale separation of those charges. The latter comes from the energy mani-

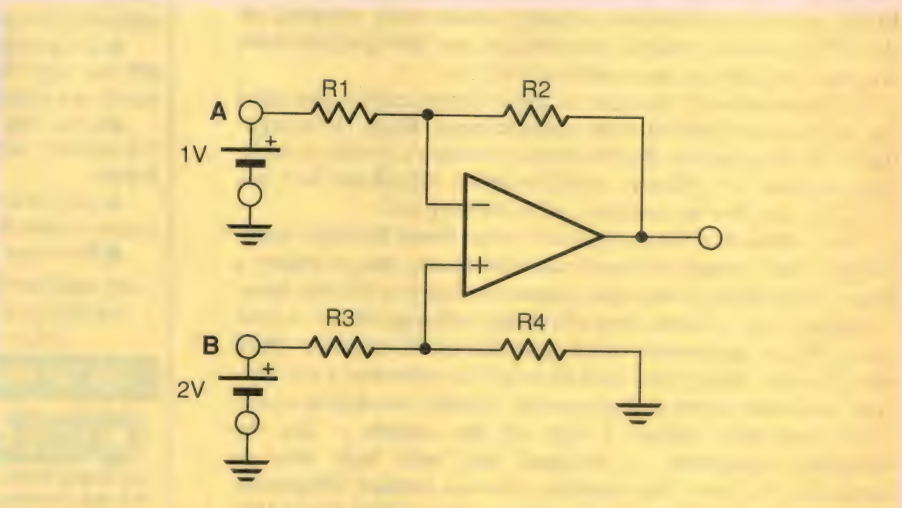


Fig.2: Find the input impedance at terminal A and at terminal B, with respect to ground.

fested in the thermal convection currents, which are sufficiently violent to destroy a modern airliner. The sun provides energy in the order of 2.5 megajoules per kilogram of water vapour, to evaporate water from the oceans and form a mixture of gaseous water and air.

This warm moist air rises and when conditions in the upper atmosphere cause the formation of drops of water (clouds), this energy is available to differentially warm the air, expand it to a lower density and drive the thermal convection currents. Some of this energy separates the positive and negative charges to provide the enormous potential differences responsible for lightning. Meteorologists and mathematicians have unravelled some of the mysteries of this process. (Bob Halliday, Killara, NSW)

While I now accept that there is no question about excess energy in a thunderstorm Bob, I'm not sure about relating the energy in a lightning strike to that contained in a bowl of cornflakes! Still, it highlights your point about the duration of the energy release.

As for Brian's figures, I can only say that Brian is quoting from the Australian Standards, which I guess have some credence. However, your letter illustrates the varying opinions on this topic, which is one of the reasons I raised it in the first place.

Voltage gradient

Our next letter comes from a reader who has seen through my attempts to stir up some discussion.

Well Peter, not content with throwing out the bait in last month's EA, you then waxed lyrical about the wonders of thunderstorms, perhaps thinking it would get someone's goat. You must know from your chemistry days that substances such as water vapour are subject to ionic bonding in much the same way as solids and so on. You are correct in that it takes energy to change the charge distribution on a cloud.

During my diverse career, I needed to find out more about lightning, and I struck gold when I talked to a very knowledgeable person who set me straight on a number of pertinent points. For example, a voltage gradient exists between the sky and the ground, which means we walk around with a voltage something like 20 to 30kV on our heads.

As your diagram shows, the positive bits, being heavier, are at the lower level of the cloud. A golfer has quite a few electrons on his head, so instant ashes. Further, the ground is not real ground, but depends on the soil and so on. I guess that's the reason for driving a grounding rod a fair way into the ground. Anyway, thanks for an interesting column, I read it and Serviceman every month. (Roy Thwaites, Woodbury, NSW)

Thanks for your letter Roy. I certainly wasn't aware that a voltage gradient is always present from the sky to the ground. And thanks also for you supportive comments.

Well, let's end it there. I think we've reached the point where we can say there's a way to go before we understand what's going on in a thunderstorm. All we really know is that Nature throws a lot of energy around. If we eventually understand some of the mechanisms, perhaps then we'll be able to develop better methods of generating electricity. Now we'll move to more practical topics.

Ferric chloride

We recently discussed how to dispose of used ammonium persulphate, but no one has ever asked us the same question about ferric chloride:

On the side of ferric chloride containers there are no recommendations for its safe disposal. Is it safe for the environment to tip ferric chloride down the drain, or is there a better means of disposal? (Todd Spurling, Umina, NSW)

After receiving your letter Todd, I contacted the local Environmental Protection Authority (EPA) office for an answer to your question. It took a couple of days for a reply, which is why your letter did not appear last month. The EPA recommends that even small amounts of ferric chloride must be disposed of through a chemical collection station, such as the Lidcombe Waste Plant in Sydney. Apparently this chemical is quite harmful to the environment.

If you need to dispose of more than 200 litres (called a commercial quantity), you need to obtain EPA approval for disposal by calling 131 555 (Sydney). I was not able to speak with anyone who knew more about this chemical, but at least we know now that it's *not* OK to pour it down the sink. Thanks for the question Todd, I'm sure a lot of ferric chloride users reading this now have red faces!

IR to UHF interface

The next letter asks a number of questions about our IR to UHF project in the September '97 edition.

I am after a way of linking my PC to a printer through an infrared link. Can the IR to UHF circuit be modified to carry computer industry standard IrDA to and from a PC, printer or other device? This will probably need an RS-232 interface IC. If so, can a parallel interface also be attached/constructed for direct to printer data transfer? If you can list a printer under $2000 with an IrDA interface, you are doing better than me.

The carrier frequency for this project is 40kHz, but can this be raised to allow the higher maximum transfer rate of, say 115,000b/s? This is the current limit on most serial devices.

What is the current situation with the high speed 'Fire Wire' serial interface? I think it's IEE379477. A guy up here produces professional videos and has a $13,000 Sony semi-pro DV recorder with a Fire Wire interface that he uses for his computer-based editing suite. So the products are around. I even had a customer ask when this magical connector will be incorporated into home cinema units, TVs and DVD machines. Do you see this as becoming the connector for all seasons, as the home entertainment and PC world start to combine?

This is the last one. Using the plain IR/UHF kit, can it be modified to run more than two IR LEDs? A company called Andrews Audio uses a similar interface (at a much greater cost) but places dedicated IR transmitters over the component's receiving windows. This would suit my situation better, so can it be done? This would mean having the receiver box within a maximum of 80cm from the furthest component. (Sean McHugh, Fannie Bay, NT)

Taking this from the top Sean, I think you're trying for an IrDA interface the hard way. You can buy this interface as a separate component for a printer, although I'm not sure of the cost. I investigated this recently, as my computer has a built in IrDA interface, so I thought I might equip my printer with an interface as well. However, I didn't go ahead, as it turned out there was no advantage.

Regarding the IR carrier frequency of the project, this is determined solely by the frequency of the 555 timer (IC2). In the circuit, you simply change C3 to a suitable value. I don't know what the carrier frequency of an IrDA interface is, and in any case, I doubt if it can handle a data rate of 115,000b/s. On my system, the highest rate I could find is 19,200b/s.

And now I have to admit to knowing nothing about what you call a Fire Wire interface. Is this perhaps a new name for an I^2C (inter-IC) two-wire serial interface? Certainly many ICs use this type of interface, but I've not heard of it becoming a standard in domestic home theatre equipment. Still, I'll stand corrected on this. Perhaps someone could help me out on this one.

Regarding your last question, the cir-

cuit as it stands can probably drive three IR LEDs (in series). However, with a suitable transistor interface between the 555 output (pin 3) and the IR LEDs, you could drive as many LEDs as you want.

Shattering glass

A few issues ago, I included a letter from a reader wanting advice on how to demonstrate to a class of school students how glass can be shattered with high frequency sound. I've now received information which might help our correspondent. First the letter from the reader who sent me the material:

In response to the question of breaking glass with sound I have received several very informative references on the subject from Mr Richard Verrall of CSIROSEC (Double Helix Club-Hobart), copies of which are enclosed. As mentioned in the material, shattering a wine glass by a powerful singer is a bit 'iffy' as there are many conditions to meet.

Mr Verrall has been experimenting in this field for many years. He intends to contact Dean Hutton of The Curiosity Show, who demonstrated this on one of his shows many years back. I will keep you informed of the results. (Linden Beswick, Newnham, Tas).

Many thanks Linden, for taking the trouble to send this material. I've condensed it, but hopefully without cutting out the essential information. It comes from an article by Willard C. Walker, Department of Physics, Southern Illinois University, Carbondale, Illinois:

A study was done on the feasibility of a classroom demonstration shattering glass with sound. Our idea was to drive the glass with the amplified output of an audio oscillator and to show that only the natural frequency would break the glass. The method used was developed with the aid of Peter Tappan's suggestion that a small source of sound be used, and a goblet was successfully shattered at 721Hz. At this frequency four nodes could be seen on the rim of the goblet.

The necessary equipment is an audio amplifier driven by an audio oscillator, and connected to a horn driver (loudspeaker). An oscilloscope and microphone are very useful and almost essential to determine the resonant frequency. At first we used a 45W amplifier and a 30W horn driver. However, we found it possible to use a 20W amplifier for shattering laboratory beakers if care was taken to match the driving and natural resonance frequencies precisely.

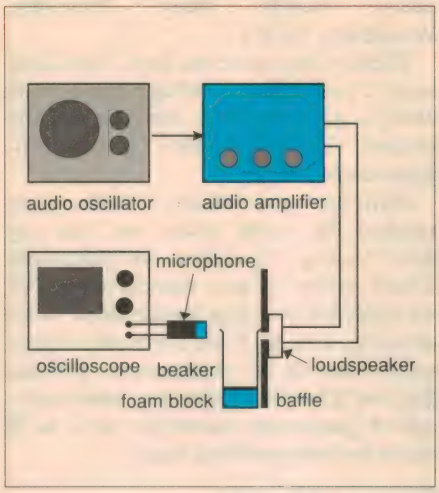


Fig.1: Block diagram of the apparatus needed to shatter a glass beaker. The oscilloscope and microphone are to measure the frequency that causes shattering.

A physically small source of sound is required to excite the glass and can be obtained most efficiently using a high-power driver which has been removed from a horn-type loudspeaker. If a powerful amplifier and a large diameter cone loudspeaker are available, this combination can be used, with the speaker mounted on a baffle which has a small hole (50mm or less) cut in it. No attempt was made to build a sound absorbing enclosure for the speaker because the horn driver was an ideal source. The sound level in the room could be excessive with this loudspeaker arrangement.

The amplifier and driver need to be able to produce at least 135 to 140dB of sound level at the natural frequency of the glass. The driver was placed behind a baffle to help direct the sound toward the glass and to minimise interference. The baffle used in these experiments was made from plywood (6mm thick x 450mm square) with a hole in the centre, tapped to match the thread on the driver; thus it served as both a support and baffle.

The selection of the glassware is somewhat critical. We found that laboratory beakers, if placed on a soft plastic foam pad to reduce damping and movement, and oriented to give maximum response, broke more easily than a high quality, thin-walled wine goblet.

The article goes on to discuss how to find the natural frequency of the glassware. It also points out that the demonstration should show that loud sound by itself will not break the glass, but sound at the natural frequency of the glass will. The setup needed for the demonstration is shown in Fig.1.

UHF channel numbers

In October, Harry Freeman asked about UHF frequencies, pointing out that his 10 year old TV set has different UHF channel numbers to his new VCR. The following letter throws some light on this anomaly:

With reference to the letter in your column in the October issue by Mr Harry Freeman, there may in fact be more than one standard for frequencies of both VHF and UHF TV. I have what could only be described as an 'ancient' field strength meter manufactured in the 1960s by Prestel, an Italian company I believe.

This FSM is still used on a regular basis despite the germanium transistors in most of its circuitry. (Geranium transistors are the ones that bloom nicely when they are planted and given a little water, aren't they?) In the lid of this meter is a screen printed chart of frequencies and a wheel type voltage to decibels converter.

The chart shows that there is a difference between our frequencies and 'theirs'. For example VHF 7 is 189.25 vision carrier and 194.75MHz sound carrier (Australia 181 and 188MHz), VHF 9 is 203.25 vision and 208.75 sound (Australia 195 and 202MHz), VHF 10 is 210.25/215.75 (Australia 208 and 215MHz).

Moving to UHF, channel 30 is 542 (Australia 541.25MHz), channel 45 is 662MHz (Australia 646.25MHz), channel 50 is 702MHz (Australia 681.25MHz) and channel 60 is 782MHz (Australia 751.25MHz).

I could go on, but I think you get the drift. In the 1960s there were two bands for FM radio, the one which is no longer used was lower than the 88 to 108MHz we use today. It seems that universal standards are not (or were not) so universal after all. (Brad Sheargold, Collaroy, NSW)

TV sets & magnetism

Last month I included an extract from a newspaper about most colour TV tubes being optimised for use in the northern hemisphere. I went on to explain how the Earth's magnetic field can upset convergence, etc., etc. But...

You may have missed my point about TV set convergence. I have no problem accepting that the earth's magnetic field

will effect convergence, but what I don't understand is how a TV knows if it is in the northern or southern hemisphere.

The horizontal component of the earth's field is always in the (magnetic) north-south direction and apart from near the magnetic poles, I would have thought (but I don't know) that its strength would be similar in both hemispheres. The only way the TV set would know where it was would be from the direction of the vertical component of the earth's field. Is it this difference that the TV sets are optimised for?

Irrespective of any optimisation, I would have thought that the orientation of a set, with respect to the direction of the horizontal component to the earth's field, would have a far greater effect than its location north or south of the Aclinic Line (magnetic equator). (Bruce Harris, Malabar NSW)

Yes Bruce, in my anxiety to discuss convergence and its relationship to external magnetic influences, it seems I did miss the point. Of course, you're quite right about the horizontal component probably being much the same in both hemispheres.

I guess the newspaper article is based on the fact that convergence will be affected if a colour TV picture tube is operating at a different alignment to the Earth's magnetic field, compared to that when the tube convergence was adjusted. But given that a set is likely to be on a different *axis* to that when the tube convergence settings were done, it seems irrelevant as to what hemisphere it's in. As tube manufacturers don't give any information on how the tube was placed relative to the Earth's magnetic field during convergence adjustment, it seems there's no way of knowing how the set should be positioned in the home for best convergence.

This suggests it no longer matters anyway. I've certainly found that modern TV sets can be moved as much as you like without any noticeable effect on convergence, so as you suggested before it seems the article is indeed incorrect.

Super-8 to video

Years ago, if you wanted to record family holidays and the like, you used a Super-8 movie camera and showed the resulting film on a Super-8 movie projector. Then came the video camera. As a result, people with Super-8 film would usually try and record the film onto video tape. The next letter describes this process, and asks why it works.

Many years ago my brother shot off a lot of Super-8 movie film. To preserve these family records, he is now copying them onto video tape using an ordinary Eumig projector running at 18 frames per second, through a light box arrangement into an ordinary video camera. The camera is running at 25 frames per second, and 1/50 second exposure. The process is giving quite good results.

However, I can't understand why there aren't any black bars or black frames on the video, as the projected film image is cut off when the film is pulled through the projector gate. How does it all stay in sync? Or is there some reason that I am missing? (K.E., Henley Beach, SA)

Hmmm. I have to agree with you K.E. that there should be some sort of 'out of sync' bars. The camera of course is operating at 50 fields per second, to give 25 frames per second, but even so, there is no synchronisation between it and the movie camera. Perhaps the bars are there, but not noticeable. Maybe a movie buff could advise us, as I can't offer an explanation.

(*Editor: I'm not sure, but I think the reason is that the CCDs used in most camcorders have a certain amount of 'lag', which effectively integrates the light and filters out the optical heterodyne effect.*)

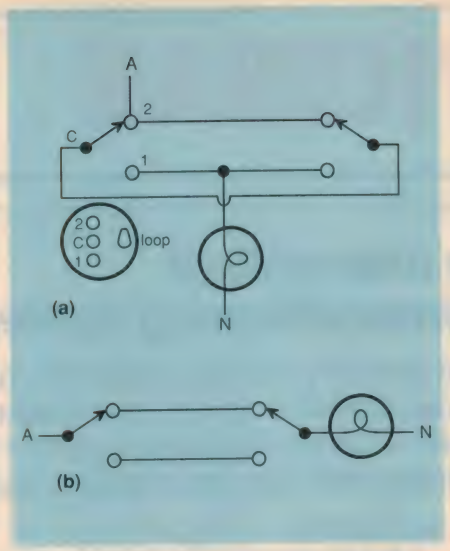


Fig.3: (a) shows how the two-way light switching circuit was wired, while (b) shows the usual way of wiring this circuit.

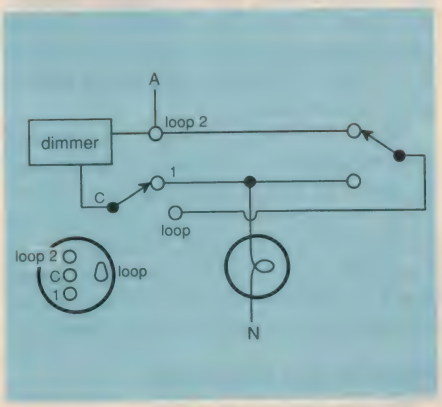


Fig.4: The lighting circuit after the plumber had connected the dimmer. The switch on the right now has no effect on the circuit.

What??

As many of you probably realised, the What?? question in November did not agree with the answer given last month. I have to take full responsibility for this, as the circuit diagram I drew for the question was wrong. Sorry folks!

I discussed this with the author of the question (Bryan Maher), and we decided that the output of the circuit as given would be a positive value equal to the supply voltage. The input impedance at either input would therefore depend on the supply voltage. In other words, without knowing the values of the supply voltage and the four resistors, the question was impossible.

So, as it's a good question, I'm presenting it again, this time with the correct circuit diagram.

For the circuit in Fig.2, assume an ideal op-amp and that all resistors have the same value. Find the impedance looking into terminal A (with respect to ground), and also the impedance looking into terminal B, again with respect to ground.

Answer to December's What

There may be other answers, but it seems the original two-way switching circuit was that shown in Fig.3(a), not the usual circuit shown in Fig.3(b). The original switch was a two-way (SPDT) HPM 770 black body switch, with the terminals as shown in Fig.3(a). The dimmer came fitted with a blue body switch, a single-pole single-throw (SPST) device, with a similar terminal configuration to the black body switch. The difference between the two switches is terminal 2, a switch contact (2) in the black body switch, and a looping terminal (loop 2) in the blue body switch.

After connecting the dimmer, the circuit was that shown in Fig.4. Compare this to Fig.3(a), and you'll see the wiring is physically similar, with the dimmer connected between the active (loop 2) and the switch common (C). Left with one wire too many, the plumber stuck it in the loop terminal, to get it out of the way.

I wonder how many people got that one! Best of all, it's from a real life situation. It goes to show that plumbers should stick to plumbing! ❖

THE SERVICEMAN

Doing battle with an intermittent in my own 'smart' airconditioning system!

Anyone who has been involved in servicing will be familiar with intermittent faults, which can drive you nuts and waste an incredible amount of time. This month's first story concerns an intermittent in an unfamiliar piece of equipment — an air conditioning control computer. And on this occasion, *I* was the customer who got frustrated with the time it took to track down the cause...

Here we go again. It seems like no time at all since I wrote the last column, yet here it is with Santa Claus knocking at the door already. I'm sure that man now comes around every six months!

Our first story this month is about one of my own problems. It's not often that I become a *customer* in a 'Serviceman' story, but just such an eventuality came up recently. And to make things even more embarrassing, the fault appears to have been an intermittent — and an intermittent of the very worst kind.

I had a modest windfall a year or so back. I managed to live long enough for a life assurance policy to mature, and I decided to use the proceeds to have my home air conditioned. I'm getting a bit long in the tooth to chop and cart firewood, and hot summer days knock me around much more than they used to do. So I set about having a heat pump installed, to warm us in winter and cool me in summer.

I had three companies quote for the installation, and it's surprising how close the quotes were. If they had not been quoting for totally different systems, I might have thought that they had got together to fix a price!

As it turns out, I chose an Australian made system of about 11kW capacity. The advantage of this particular system was that its computer control is included in the price. The other brands had simple on/off controls, with computerised controllers at additional cost.

So early one Monday morning a team of installers arrived, with crates and boxes and rolls of piping and cables and — you name it, it was there. Some of the ducting was nearly a metre in diameter and although there is a lot of room under my house, I still wondered how they were going to be able to get that vast heap of stuff stowed away out of sight.

By that evening, most of the large items had been fixed in place and work had begun on the ducting. Next day the electricians arrived and began rewiring the switchboard, and the supply authority crew arrived to install the three-phase supply needed to run the system. By Friday afternoon, everything was in place and wired in.

The commissioning technician arrived early on Monday morning and by noon he had everything up and running. He showed me how to switch the system on and off, and explained that I would be able to programme the times that I wanted the machine to run, and set the zones that I wanted to air condition.

Here's the manual!

He gave me a copy of the user manual and suggested that I study the programming mode, since he had not been able to master it in spite of having been working with the system for six months. That didn't augur well for the coming weeks, and until I gained some idea of the programme we had the system turning on and off at all sorts of odd times. We also had hot air blowing into empty rooms while we shivered in others...

Anyway, by the time I had become familiar with the system and had learned how to preset our requirements, it had become obvious that there was something seriously wrong with the thermostat and/or the controller.

The controller allows one to set the required temperature, called the 'Set Point', and for starters I chose to set it at 20° Celsius. However, the rooms being conditioned kept getting hotter and hotter, until we were sweltering in mid-summer temperatures.

Yet the display on the controller insisted that the temperature had not reached the set point. For most of the time the display sat around 16.5 - 17°. In the early morning, when I suspect the room temperature was down around 14°, the display still insisted that it was 16.1°.

I wasn't particularly concerned about what the display said. What did concern me was that the compressor and fan kept running and the temperature kept rising. There is a simple thermometer in the kitchen, and this was telling me that the temp was 25° and going higher...

And there was another problem. With the machinery running continuously and consuming perhaps 10 kilowatts hour after hour, I could see my power bill skyrocketing. Eventually, I switched off the automatic control and reverted to running the system manually.

Needless to say, I complained to the company and their technician was on my doorstep first thing next morning. But wouldn't you just believe it — the controller display was showing the true air temperature, within one tenth of a degree, and when we switched the sys-

tem to auto, it cycled perfectly. It brought the house up to the set point within 10 - 15 minutes, then turned off exactly as it should do.

I think the technician believed I was 'off the rails' and as he left, he suggested that I keep a record of room temperature versus indicated temperature. Then, if it continued to misbehave, he would come back and see what could be done.

He had been reading the temperature with a Fluke thermocouple module on a good digital multimeter, so I decided that I should use the same combination so that there would be no arguments about the accuracy of my measurements. After calibrating the new module, I compared its readings with another very accurate thermometer used in the physics laboratories at the University. My instrument was spot on, and tracked precisely over the range that I was interested in.

Didn't make sense...

For the next week, I recorded air and display temperatures and could find no correlation at all. Sometimes the display started close to room temp, but increased only half to one degree while the room temperature went up five or six.

At other times, the display started five degrees low and stayed there, not budging at all while the room temp went up by five degrees.

One day I took over manual control of the system and graphed the results. The room temperature graph went up and down like the teeth of a crosscut saw, while that for the display unit showed almost no variation over several hours. That was enough for me, so I called the company and said "Fix it!"

Well, over the next week or two the technician changed the controller. That didn't work. Then he thought the wall mounted sensor might be affected by cold air inside the wall cavity. He blocked the sensor off from the cavity, but that didn't work.

Then he thought there might be loose contacts in the wiring back to the main unit. But tightening them didn't do anything either. In all this time, the system would work properly for a day or two then begin to play up. I'd call the technician and we'd get another good day or two, then it was back to the same malfunctions as before.

Same excuses!

Now I've been on his side of the fence for 20 years or more, and I began to hear from this technician all the excuses that *I* have used to my own customers...

Then I had a second sensor installed, to give early warning when the temperature in the living room was going too high. This helped a bit, but the system would still play up at quite random intervals.

I made a list of all the malfunctions, and it soon became apparent that every fault was different. Many were variations on the same theme, but no two were exactly the same. So what hope did the poor technician have of ever seeing the problems I was complaining of?

The control program for the computer is in an EPROM, while my settings are held in an EEPROM. The technician had heard about socketed ICs being dodgy, so he first tried cleaning the sockets, then he removed them completely and soldered the ICs onto the PCB. This made the system a bit more reliable for a few days, but then it was back to its old erratic ways.

The control panel for the Serviceman's air conditioning system. Tracking down the cause of a temperature control intermittent took a lot of time and trouble!

Finally, the company decided that they would exchange the whole computer board. The cost of the changeover was borne by the manufacturers under warranty, but it was still a big exercise to arrange the delivery of a spare board, replace it in my system then reset all the default values in the computer memory. And, of course, there was no guarantee that the faults would go with the old board.

By this time the system had been installed for three months and only then was it operating at anything like full reliability. Unfortunately, by then it was spring time and the system was not often needed. When it didn't start up at the preset time, I'd have to check the temperature to see if that was the reason for the No-go. After so many weeks of unreliability, it was hard to bring myself to trust the rotten thing.

But that was all about two years ago and the system has since operated perfectly. It's great to wake up on a frosty morning and hear the gentle susurration of warm air flowing into the room. The new computer board has learned my likes and dislikes, and delivers its services without a trace of its predecessor's recalcitrance.

I never did learn what the trouble with the old computer was. It went straight back to the manufacturer, and the distributor wasn't interested enough to chase up the outcome. For my part, I'd bet pounds to peanuts it was a dry joint, associated with either the EEPROM or the microprocessor.

One thing I did learn though. I now know why my customers often got a bit stroppy after I'd chased their intermittents for weeks and weeks, and got nowhere.

Happy organ lover

But enough of my problems. Here now is a Good News story from Keith Vieritz, of Kalangur, in Queensland. If you remember, a month or two back I featured a letter from Keith explaining why we were not able to give out addresses of correspondents. Keith's letter mentioned that he was in the process of restoring a Hammond Organ and I suggested that a successful outcome might make a story for these pages.

Well, there has been a successful outcome, and Keith has written again with the full details of his efforts. Here's what he has to say...

I was sitting down quietly reading October's issue of EA and listening to my wife playing on our partially restored Hammond organ, when I came across my letter in the 'Serviceman'. If you remember, I was inquiring about contacting a Mr Pearce who had restored his instrument.

I wish to thank you very much for sending my letter on to Mr Pearce, because eventually it made possible the complete restoration of our Hammond 'Grandee' organ.

Mr Pearce went to a lot of trouble to locate a copy of a suitable service manual, which he purchased and posted on to me. The price was quite reasonable, considering its rarity and the amount of information it contained. Without a manual, I would not have been able to successfully complete the full restora-

tion, seeing that there was one circuit board missing.

I am now retired from full time work and had spent many hours on the organ, cleaning it inside and out, polishing the cabinet, replacing corroded connections and checking the circuit boards for any obvious faults.

The organ in its day had played home to a family of mice and they had done quite a lot of damage with their untidy toilet habits. Eventually though, I had reached the stage where everything was as good as it could be.

Some of the things I fixed were:

1. Replace the 0.1uF 600VDC capacitors on the Leslie speaker relay with 250V AC capacitors, as advised by Mr Pearce. I checked these capacitors with a 625 volt insulation tester and one of them broke down. It was probably just a matter of time before it failed.

2. The heat sinks on the two audio amplifiers were very hot. The bias current of the output transistors was around 300mA. I replaced a fixed 100 ohm resistor in the bias network with a 100 ohm preset and adjusted the current to 100mA.

3. When the upper manual 'sustain' tab was on, one note would keep singing. I located the printed circuit board associated with this note and moved it to the end of the mother board, where it was more accessible. All the daughter boards are identical so they can fit any note. The sustain is controlled by the discharge of a capacitor in the keying circuit and this is controlled through signal diodes.

I could see that someone had been looking for this fault in the past. He must have been using a pair of crowbars for probes on his multimeter, by the way the diodes were all twisted about. I reckoned the fault was in one of three diodes for this note, so I started lifting one end of each diode. Of course, it was the third diode that proved leaky!

I replaced this with a 1N914 and the problem was solved. I couldn't measure any leakage in the faulty diode so I put 100 volts across it in series with a DVM and still couldn't measure any leakage. The discharge resistor in the sustain circuit was 5.6 megohms, so a leakage equivalent to 10 megohms or so would be enough to stop the complete discharge and keep the note leaking through.

At this stage the service manual arrived and I eagerly went through it. There at last was the missing circuit board diagram. Now, I thought, I would be able to complete the restoration. But it was not to be, or at least not immediately. My old employer rang up to ask if I could return to work for a month or so, to help through a very busy period. So the organ had to wait.

In the meantime, my son scanned the circuit overlay of the missing board into his computer and then painstakingly removed all the components. When I retired again I had the artwork ready to make a new board. This was done by the iron-on photocopy method and worked quite well.

I didn't have any data on the original transistors that Hammond used, but I couldn't see why BC549s and BC557s wouldn't do the job just as well. So I assembled the board to as near as the Hammond original as I could. After a preliminary check on the bench, which showed that everything was working as well as I could understand the circuit, I fitted it to its position in the organ and switched on. Would you believe, it worked straight off!

The service manual gave a setup procedure for the organ — how to adjust the various presets and where to measure signals, most with a digital multimeter and some with a CRO. This new board had three presets on it to set the balance between the lower manual (and pedals) and the upper manual. They adjusted readily to about the middle of their ranges.

As I continued through the setup procedure, I found that the high frequency output of the rhythm unit was non-existent. The preset controlling this had been wound right down. Setting it to the correct level really brought the rhythm unit to life, with the sound of cymbals, brush and snare that were not working before.

Checking the residual hum level across the main speaker showed that it was a little higher than specified. The Leslie speaker is hinged and when it was swung out, the hum level was reduced. The two drive motors were not earthed. They are 240 volt AC shaded-pole motors and could not be classed as double insulated, so I earthed them back to the power supply. This reduced the hum level to well below audibility with the expression pedal fully down.

There always was a certain amount of high frequency signal leakage and while I was poking around the Leslie speaker, I happened to touch the plug connector to the expression pedal. It responded with a greatly increased audio noise. Then I pushed it a little closer to the signal cables from the tone generators. The signal leakage increased enormously.

The signal cables to the expression pedal are shielded, but a plastic plug doesn't do much to shield the pins inside it. So it was off to the kitchen to grab a piece of alfoil, wrap up the plug, and earth it. Blissful silence followed.

It is only a few days now since I completed the restoration, and no more problems have shown up. I feel that now the organ is restored to its old magnificent self. It is a credit to the Hammond designers and

In case you're wondering, here's what a Hammond Grandee organ looks like normally. Reader Keith Vieritz has now got his unit working 'as new', after having rebuilt a missing board...

builders that one of their instruments can still give top performance after 20-odd years and a mouse plague. These old organs should last forever, or at least as long as we can still buy the occasional discrete component.

Really, there was not anything much in the way of component failure in this organ. It was mainly cleaning and repairing the mess left by the little rodents, and cleaning and repairing the cabinet where it had been knocked about.

The missing card was probably removed some years ago by a serviceman who had hopes of repairing it, but then gave up when he realised the many hours that would be involved in just replacing the corroded edge connectors. As Mr Pearce said, "It has to be a labour of love".

I enclose a copy of the circuit and board pattern for the missing card. It mixes the lower manual and foot pedals and sends then to the main amplifier via the expression pedal. This circuit also has three gates in it which are triggered independently by the rhythm unit, so that a rhythm pattern accompaniment can be used on the lower manual and the 16 foot and 8 foot pedals.

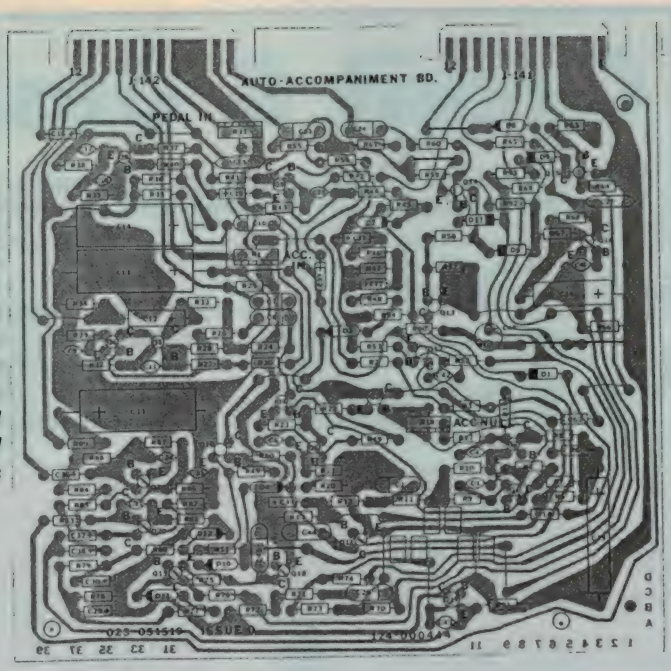
My wife is getting a lot of pleasure out of playing the organ and experimenting with the auto-accompaniment — which is quite a step up from her old piano accordion. And I am getting a lot of pleasure listening to it. It was quite a challenge restoring this instrument to full working order.

Many thanks to both The Serviceman and Mr Pearce for their help.

See what I mean about a 'Good News' story? The chances of making a new PCB from a manual overlay, and having it work first off, must be one in a very large number. I've tried something similar on occasions, and the exercise has always been followed by long sessions of de-bugging — to use a computer-age metaphor.

I'm glad that this column and our correspondent Walter Pearce were able to help Keith restore his fine old Hammond. I hate to see valuable but uncared-for items going on the tip. Thanks for that story, Keith. And I hope you wife continues to enjoy her 'Grandee' for many years to come!

(Incidentally, just recently I saw an immaculate '82 model Honda sedan go into the crusher in a wrecker's yard. It made me weep to think that somebody had cared so little for the car that it wasn't worth restoring. No doubt it had been stripped of re-usable parts, but the shell suggested that the car would have graced my carport!)



The PCB that Keith Vieritz had to replace in his organ was quite a complex one, as you can see from this diagram reproduced from the Hammond manual (obtained with Mr Pearce's help).

Tip for novices

Now for a short note for novice servicemen, and for vintage radio restorers in particular. It's from Don Rees, of South West Rocks in NSW. Don tells of a modern example of an age-old problem. He writes...

I recently retired from my radio and TV business after 45 years of tending to customers at The Entrance, on the New South Wales central coast. Not long afterwards I became my own customer when I had to attend to my own TV, an old AWA 'K' chassis C617.

The poor old set had developed noisy sound, a slight crackle that was not affected by the volume level. It turned out to be the result of a problem that has always been with us, yet is probably unknown to some of the younger folk now working in the industry.

The fault was a noisy audio driver transistor (2SC1213), which was suffering a build up of metal between the emitter and collector pins. It appears that the plating on the leads migrates across the plastic body of the transistor, eventually causing an erratic leakage path.

The same sort of thing happens with other types of plastic bodied transistors — 2SA628 and 2SC711 are two that I know of.

The point I wanted to make to the youngsters is that the same thing used to happen to valves, particularly the small button-based types, but it was also known to happen with old octal socketed valves, and ever earlier types.

The effect is common with all electrical equipment that uses silver plating on pins and leads to reduce contact resistance. It appears that silver is able to migrate along lines of electrostatic strain. Any two silver plated pins with a few volts between them will eventually be joined together by a microscopic track of molecular silver.

In the case of valves, it was possible to scrape the silver off the glass and thus restore the valve to normal. I don't know if the softer plastic of transistor bodies will release the silver so easily, but it is worth a try.

This trick is worth remembering by anyone restoring vintage radios. The fault can cause spurious oscillation, distortion and even a completely dead set, as well as just noisy sound. If the valve is otherwise OK, it might be worthwhile to inspect the envelope for silver pollution.

The base will have to be removed to get at the glass seal, but most really old valves seem to have loose bases anyway. The silver can usually be seen between the pins, even without a magnifying glass.

Thanks for that note, Don. It's a common enough phenomenon, but one that seems to have been largely forgotten in these days of (relatively) low voltage circuits. It was very common in valve type, high voltage circuits.

So, have a close look at any noisy transistor. You might just be able to salvage the situation by scraping way the deposit between the leads.

That's all for this month. I don't know what next month will bring, but you can be sure it will be a fascinating insight to life on the service bench. See you then? ❖

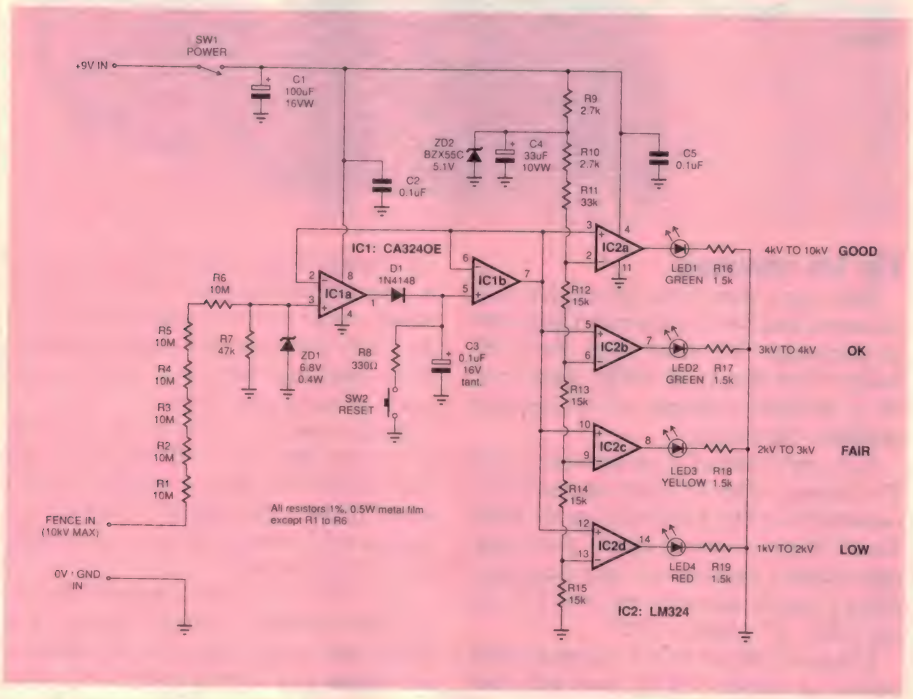
Circuit & Design Ideas

Interesting original circuit ideas and design tips from readers. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. We therefore cannot accept responsibility, enter into correspondence or provide any further information.

Electric fence tester

A few weeks ago, a neighbour asked if I could help him trace the faults in his electric fence. This circuit is the result.

It gives an accurate indication of the peak pulse voltage in 1kV steps. The first LED lights at 1kV, the second at 2kV and so on. The LEDs remain lit for several seconds after disconnecting the unit from the fence, which makes it easy to read. A reset button has been added to rapidly discharge the unit for subsequent measurements.



In practice, it is an easy matter to trace leakage points by working towards the point of lowest voltage.

The circuit itself is simple enough. Resistors R1 to R7 divide the input voltage down to a workable level and feed it into IC1, a CA3240E dual MOSFET-input op-amp, configured as a four stage voltage indicator driving four LEDs.

The complete unit is powered by a 9V battery, which should last a considerable time, especially if the circuit is reset immediately after each measurement — because the current consumption rises from about 5mA to around 25mA with all LEDs lit.

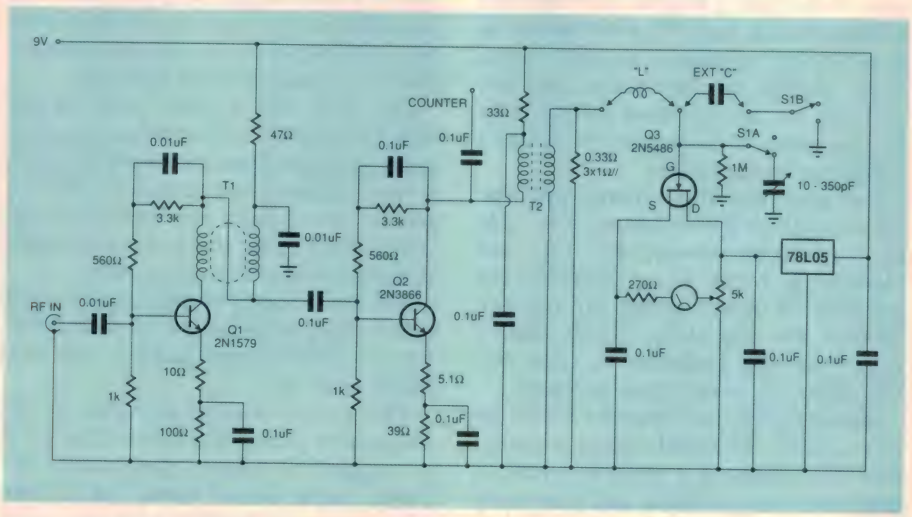
A point to keep in mind when using this tester is that some fence energisers have a negative pulse output, in which case the test leads will have to be reversed. Reversed polarity pulses will not damage the unit because ZD1 stops the input at pin 3 of IC1 from going more than 0.6V negative. The display will only light, however, when the leads are correctly connected.

Steve Carroll
Timmsvale, NSW **$40**

Resonance meter & cap tester

This is a circuit for a resonance meter that I recently completed. It can be used for finding the value of capacitors up to 320pF and indicates resonance up to 30MHz, making it a useful companion for the RF Signal Generator published in *Electronics Australia* in May-June 1996. The circuit is based on three main functional blocks, with Q1 configured as a wideband RF amplifier. Q2 provides a low impedance output, as well as an output for an external frequency counter if required. The output of the meter feeds into a simple RF AC voltmeter, based around the N-channel FET Q3.

The 5V regulator provides a reference 5V to the meter circuit so that slight changes in battery voltage don't affect the meter's calibration. The winding details for the coils are as follows: T1 — eight turns bifilar wound on an FT37/43 core; T2 — an FT50/43 core with 23 turns on the primary and one turn for the secondary.



Bert Toomey
Bucklands Beach, New Zealand **$40**

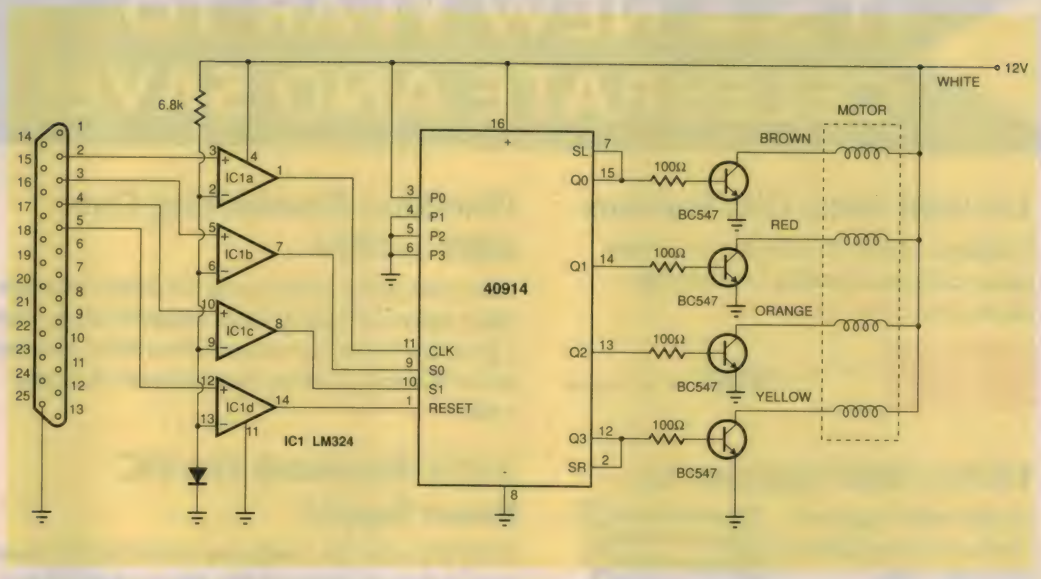
THIS MONTH'S WINNER!

PC control for stepper motor

I used this circuit to interface a four-winding reluctance stepper motor to a PC's parallel port. I used a motor from an old 5.25" floppy disk drive, which had 150Ω windings.

These old drives are quite common, and are very useful for parts.

The 40194 chip is a universal bi-directional shift register, wired up here with its shift-left input connected to output Q0, and shift-right connected to Q3. In this configuration, data shifted out of the last output is fed back into the start, no matter which direction the shift register is running.



The parallel input connections are hard wired so that when the chip is reset (through software) a value of 1000 is loaded onto the outputs; this results in Q0 going high for an initial output.

The clocking is done by the PC, which also provides direction control via the S0 and S1 inputs on the chip. If S0 is set high and S1 low, then the motor will run in one direction; with S0 low and S1 high the motor will run in the other direction.

The four op-amps provide an interface from the PC's 5V outputs to the 12V stepper motor circuit. D1 and R1 lift the inverting input of the four op-amps to 0.6V, to ensure reliable switching for a logic zero output from the port.

If you want to add more motors, only two extra control lines are needed per motor, as the reset and clock lines can be common to all. (A common clock line will mean that all the extra motors will run at the same speed though.)

The listing shows a sample program that I used, written in Pascal, but it sould be simple to re-write in BASIC or C.

David Mueller
Bayswater, NSW $35 ❖

```
portw[Port] := 0;           {Resets the}
portw[Port] := 8;           {chip.}
portw[Port] := 2+4+8;       {Preset chip}
portw[Port] := 1+2+4+8;     {Pulse clock}
portw[Port] := 2+4+8;       {high, so Q0}
portw[Port] := 8;           {equals 1.}

for i:=1 to 50 do
begin
   portw[Port] :=2+8;       {Clockwise.}
   portw[Port] :=1+2+8;     {Pulse clock}
   portw[Port] :=0;         {one step.}
end

for i:=1 to 50 do
begin
   portw[Port] :=4+8;       {Anticlockwise}
   portw[Port] :=1+2+8;     {Pulse clock}
   portw[Port] :=0;         {one step.}
end
```

Aid for soldering SMD components

When soldering SMD components with a conventional soldering iron, it is often very easy to apply too much solder to the joint, and either bridge adjacent tracks or pads or swamp the component entirely. A simple and effective way to deliver a measured amount of solder to each joint is to use a normal propelling pencil. I use a Faber-Castell 0.7mm pencil with a stainless steel nib — these can be picked up at stationers and art supply houses for a couple of dollars, and seem to be designed for the job.

Of course fine solder only comes with a 0.71mm diameter (just to be difficult), but you can stretch short lengths of it with a couple of pairs of pliers to bring the diameter down, and also remove any kinks and bumps at the same time. I found that a 200mm length would stretch 20-30mm before breaking, and could then be chopped into 50-60mm lengths and installed as normal pencil leads. One 'click' dispenses enough solder to tin the pad prior to positioning the component, while two clicks provides enough to finish the joint.

Graham Cattley
EA Staff

WIN OUR 'IDEA OF THE MONTH' PRIZE!

As an added incentive for readers to contribute interesting ideas to this column, the idea we judge most interesting each month now wins its contributor an exciting prize, in addition to the usual fee. The prize is a complete closed circuit TV system, comprising a 5" B&W video monitor, CCD video camera with stand, power supply and cabling. This system comes from our sponsor Allthings Sales & Services, and is valued at $369.00!

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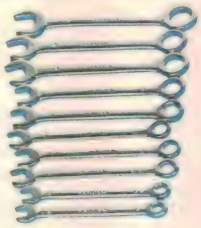

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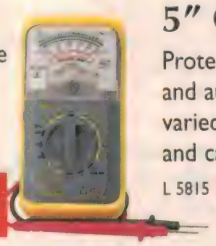

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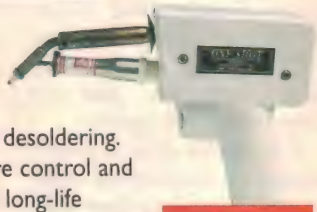

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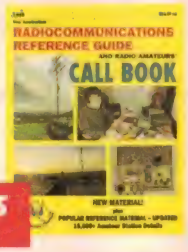

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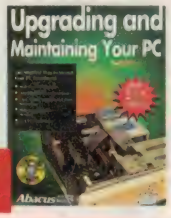

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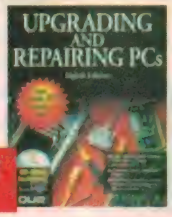

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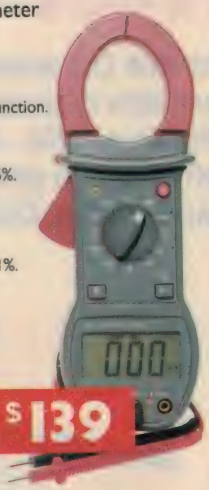

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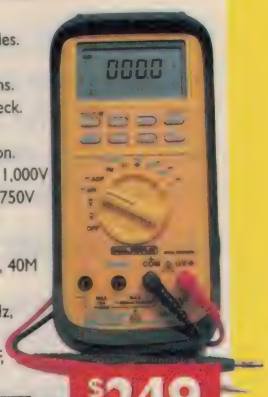

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Construction Project:

'FOUR IN ONE' MINI BENCH SUPPLY

Here's a low cost, easy to build little DC power supply for the experimenter's or designer's workbench. It has no meters or adjustable outputs — just the four main DC supply voltages that most of us need for about 95% of the time: +5V, -5V, +12V and -12V. They're well filtered and regulated, easily switched on and off (either in pairs or all together) and you don't have to worry about checking the exact output voltages with a DMM...

by JIM ROWE

Variable and fully metered DC bench supplies are essential for checking circuits that operate from odd-ball voltages, and for checking the voltage range over which a circuit operates correctly. But for a lot of general experimenting and development work, they can often represent 'overkill'.

Some of the bells and whistles on a typical supply can even be a drawback, when you're simply trying out an idea for a circuit that will work from a bog-standard voltage rail. On all except the more expensive bench supplies, for example, the meters are either too small or too modest in accuracy to allow you to check confidently that the output is set within tolerance to +5V, +12V or whatever. So you generally have to reach for the DMM and check things properly, before even connecting up your circuit.

There can also be a problem when it comes to trying out a circuit that needs multiple supply rails. Most bench supplies have two outputs at most, and even those with two outputs are generally 'balanced' — with positive and negative outputs which closely 'track' or match each other. Which is great when you *want* balanced rails, but not so useful if you want say +12V and -5V. In such a case you generally need a second supply altogether.

If you need *three* rails — say +5V, -5V and +12V, there's usually no option but to use a second supply. And if you need a fourth rail, you might have to end up using either a third supply, or at the very least two different balanced twin supplies. All of which can be a bit of a pain, especially when it comes to switching the various voltages on and off...

It was experiences like these which made me realise recently that, for a lot of day-to-day work on the bench, what would be really handy was a small supply with say four fixed outputs — say +5V, -5V, +12V and -12V — and easily switched on and off, either in pairs or all together. Such a supply wouldn't need any voltmeters, because of the fixed outputs, and probably wouldn't need current metering either for a lot of work. And none of the outputs would need to have a high current/power rating, since a great deal of bench work nowadays involves very low power circuitry.

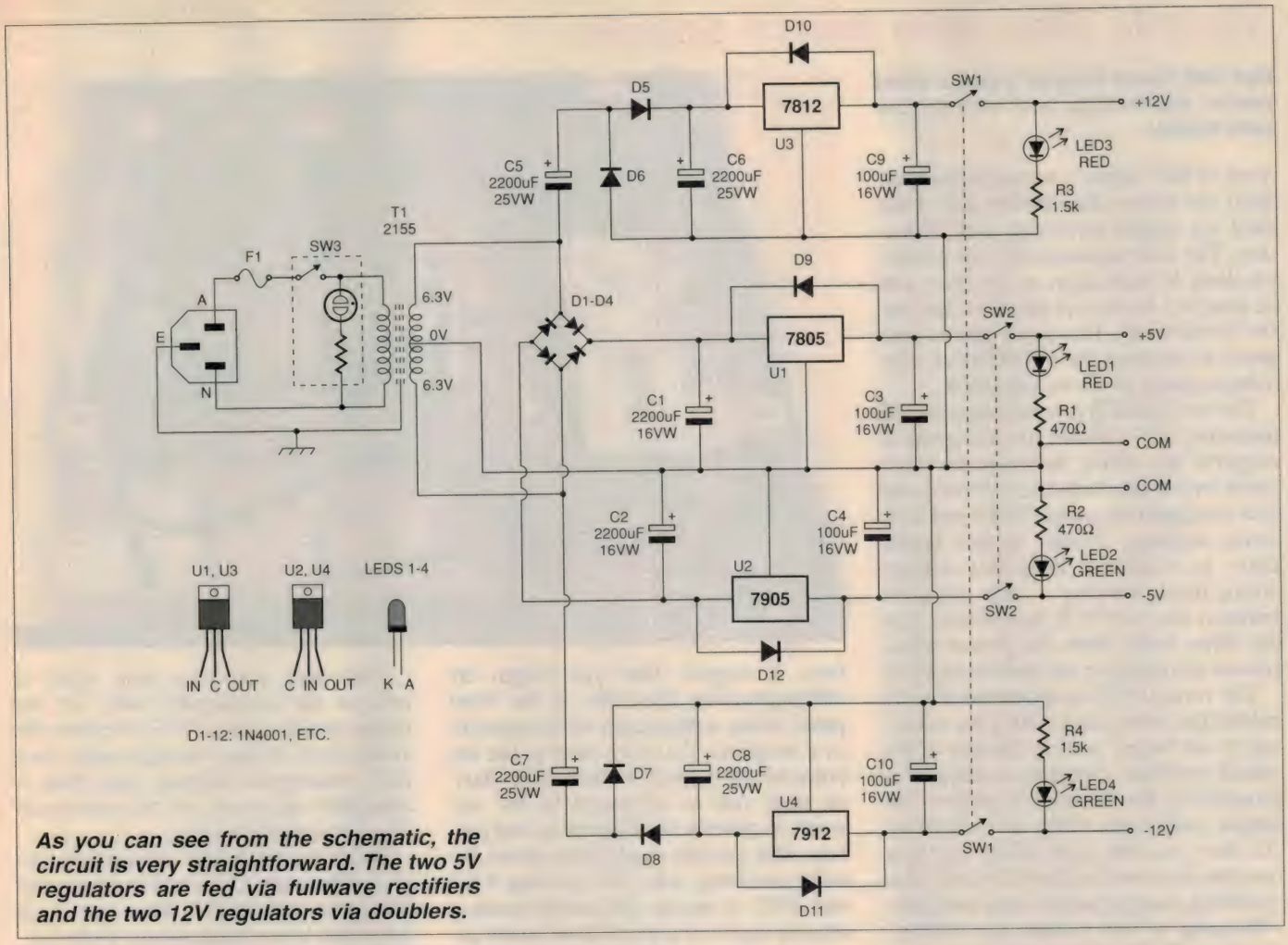
So that's the thinking behind this new four-in-one bench supply. It's cheap, it's easy to build and it deliberately leaves out a lot of the traditional bells and whistles. But at the same time it's also a surprisingly practical little unit, which is quite often more convenient than a couple of fancy variable supplies.

By the way, the output terminals are all spaced on 19mm centres, to allow the use of standard dual banana plugs if desired.

The circuit

As you can see from the schematic, it's really very straightforward, with four simple fixed-voltage regulators operating from a rectifier and filter system based on a standard 2155-type 15VA power transformer. It's mainly the transformer which sets the unit's total power rating, of around 15 watts.

The rectifier circuitry might look a bit odd, but when you look closely it's simpler than it looks. There are two conventional full-wave circuits developing the raw DC for the two 5V regulators, and then a couple of half-wave doublers to develop the unregulated DC for the two 12V regulators. This turned out to be the simplest and cheapest way I could achieve the desired result.



As you can see from the schematic, the circuit is very straightforward. The two 5V regulators are fed via fullwave rectifiers and the two 12V regulators via doublers.

Diodes D1 and D4 are used to charge reservoir cap C1, to produce about +9V (no load) to feed U1, the +5V regulator. Similarly D2 and D3 charge C2 to about -9V, to feed the -5V regulator U2.

To produce the higher raw DC voltage to drive +12V regulator U3, capacitor C5 and diode D6 form a 'pump' circuit whereby C5 is charged up to about 9V during negative half-cycles of that half of the transformer secondary. Then when that side of the secondary swings positive, the charge on C5 is added to the peak value of the winding voltage and effectively dumped into C6, via D5.

Although this tends to give a somewhat high voltage across C6 under no-load conditions (about 18-19V), the regulation is quite poor so that as the current drawn by the load circuit of U3 rises, the raw DC level falls and hence the dissipation of U3 is not excessive.

Components C7, D7, D8 and C8 perform exactly the same roles in the negative voltage doubler, to produce the raw DC for U4.

As you can see each of the four regulators has a 100uF stabilising capacitor across its output, and also a reverse diode connected between output and input. The diodes are to protect the regulators against damage if the outputs are accidentally connected to a voltage higher than the voltages across C1, C2, C6 or C8 respectively. This can happen if you have turned off the supply's main switch (SW3) sometime previously, and suddenly turn on one of the two output switches — to connect the regulator outputs to still-charged bypass capacitors in the circuit on the bench.

To allow convenient switching of the outputs, SW2 allows you to switch the two 5V outputs together while SW1 performs the same role for the two 12V outputs. But the two switches are also positioned quite close to each other on the front panel, so with a little digital dexterity it's also quite easy to switch all four outputs on and off within a few milliseconds of each other...

To save costs and keep the circuitry as simple as possible, there's no current monitoring or limiting, apart from that provided by the regulator chips themselves. These have inbuilt thermal shutdown, so if there's a serious overload condition or short circuit in the circuit you're testing, the appropriate regulator will tend to shut down fairly quickly — protecting the supply itself, at least, even though one or two of the components on the bench might conceivably 'release a little smoke'.

So that you'll at least be made aware of such a situation, each of the four outputs has a simple LED output status indicator using LEDs 1-4 and resistors R1-4. This means that should one of the regulators begin to shut down in response to an overload, you'll see that output's LED becoming dim. That's the cue to hit the appropriate switch, and investigate the cause of the overload!

This simple system seems to work quite well in practice, despite its very low cost.

Construction

The complete supply is housed in a readily available low cost plastic instrument case, measuring 160 x 155 x 65mm. Inside the case, most of the circuitry apart from the power transformer is supported on two small PC boards — one horizontal and mounted on the lower half of the case near the back, and the other vertical and immediately behind the front panel.

The horizontal board, coded 98ps1a, measures only 70 x 63mm but supports

'Four in One' Mini Bench Supply

Use this inside view as a guide when you're assembling and wiring your own supply.

most of the supply's components apart from the power transformer and those used for output switching and indication. The four regulator ICs are mounted along its rear edge, so that they can be attached to the rear panel of the case for heatsinking. The usual plastic rear panel is replaced by a 2mm-thick aluminium plate, to act as a heatsink.

The vertical PCB is coded 98ps1b, and measures 108 x 39mm. It's designed to simplify the wiring between the front panel output terminals and switches, and also to support the output LEDs and their series resistors. Thanks to this board, there is relatively little low-voltage wiring inside the case — only six wires between the two PCB assemblies, plus the three wires from the power transformer secondary to the horizontal PCB.

The vertical PCB is supported directly behind the front panel mainly by soldering its six largest pads to the rear of the output terminals. Some extra support is provided by the 12 connections from the output switch lugs, which are quite short. As there are only four LEDs and four resistors mounted on the PCB itself, this mounting arrangement is quite adequate.

Because of this method of construction, I suggest that you begin by drilling/reaming the holes in the front panel, using a photocopy of the artwork as a template. You may want to file the holes for the output terminals with 'flats' on each side as suggested by the artwork, to prevent them rotating, and perhaps also provide small holes above the main mounting holes for switches SW1 and SW2, to accept the switch locating spigots (again to prevent these rotating).

Note that you may also need to enlarge the rectangular hole for the mains rocker switch SW3, to allow the switch body to pass through easily. Just don't enlarge the hole any more than is absolutely necessary, or the switch will be able to move around...

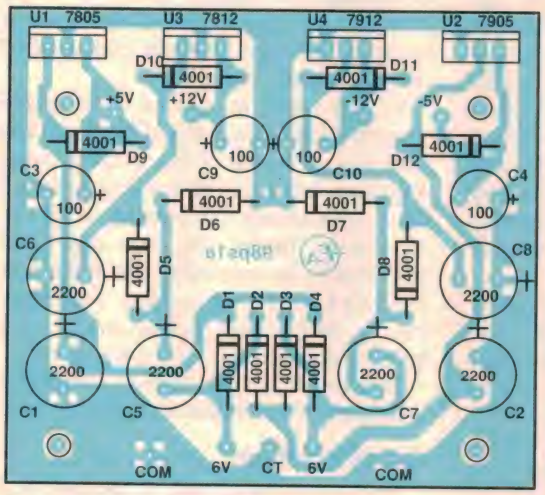
Check that each hole intended to take one of the 3mm LEDs will in fact accept the appropriate LED without too much force, and if necessary enlarge them carefully from the rear with a tapered reamer. The ideal hole size is where the LED body will just fit snugly, without being loose.

With the panel itself prepared, you can attach the dress panel to its front and then mount the switches and output terminals. The switches should be fitted with the nuts adjusted so that the switch bodies are reasonably close to the panel, with the threaded ferrules protruding a little beyond the front nuts. (This is to facilitate board mounting, later.)

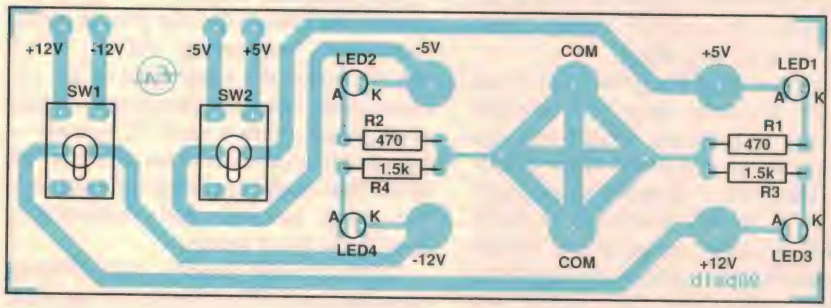
The green terminals are fitted in the two centre 'Common' positions, with the black terminals for the negative outputs and the red terminals for the positive outputs.

Now fit short lengths (say 20mm) of tinned copper wire to each of the lugs at the rear of SW1 and SW2, looping each one around before soldering — to make sure it can't drop off when you later solder it to the PCB pad. Position each wire so that it leaves the switch lug directly towards the rear, on the lug's axis.

You should now be able to turn your attention to the vertical PCB, mounting the four resistors to it and also six terminal pins for connection to the horizontal board. Four of the pins connect to



Here are the overlay diagrams for the two PC boards, again to use as an assembly guide. Note that although the regulators are shown as if they're mounted on the horizontal board (top left), they're actually mounted on the back panel; PCB terminal pins are fitted to the board to facilitate their connections (see opposite page).



the pads above the output switches SW1 and SW2, while the remaining two connect to the pads at the 'side' corners of the diamond pattern, between the 'Common' output terminals. Note that all six terminal pins are fitted to the copper side of the board, for convenient solder connections later.

You can also pre-attach the four LEDs to the PCB — each in its correct location and orientation as shown on the overlay diagram, but with the body only about 10mm above the top of the board. Only 'tack solder' one lead of each LED to its PCB pad with a minimum of solder, merely to hold the LED in place for the time being.

With this preparation work done, you should be ready to offer up the PCB to the rear of the panel, feeding the wires from SW1 and SW2 through the corresponding holes and engaging the rear of the output terminals with the holes in the large pads. You should be able to position the PCB so that it is parallel with the panel, and with the tips of the terminals just protruding through their pads by about 1mm, for convenient soldering. (A small amount of adjustment may be necessary in the 'fore-and-aft' positioning of SW1 and SW2, to achieve this parallel assembly situation.)

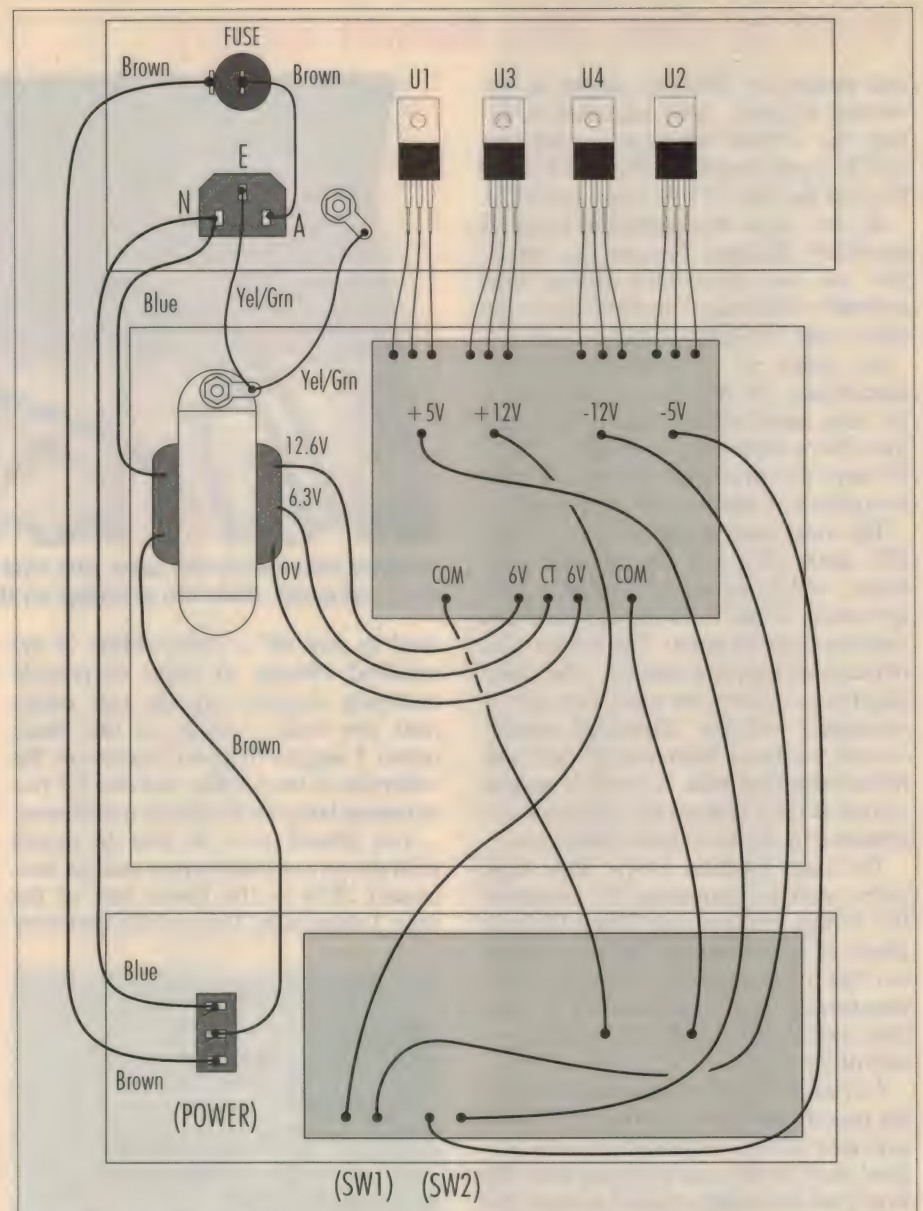
You should then to able to solder the terminals to their PCB pads, and also all 12 of the switch wires to their pads — cutting off any excess.

The final step in completing this front assembly is to 'untack' the temporary soldering of each LED, and carefully move it forward until its body is located snugly in the correct panel hole. Then you can solder both of its leads to their PCB pads permanently. The LEDs will probably be secure enough after this, although you may wish to add a small fillet of glue around each body (at the rear of the panel) to ensure that it can't move.

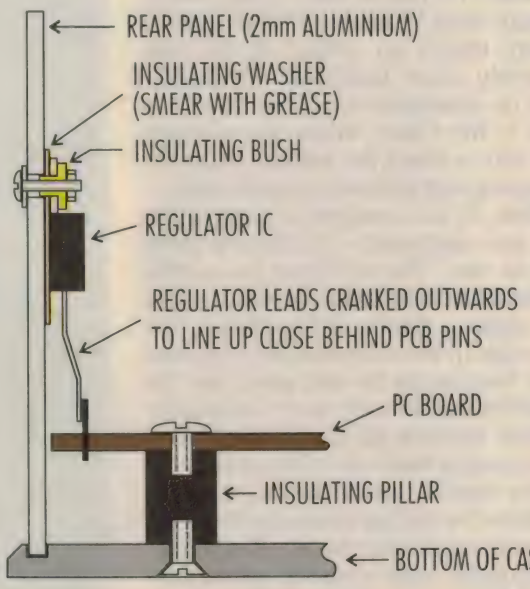
Horizontal board

The horizontal PCB is assembled in a somewhat more straightforward fashion. I suggest that you fit its terminal pins first; there are 21 of these — 12 along the very back edge, for the voltage regulator connections, four in a row about 14mm back from the rear edge for the actual DC outputs, and five along the front. The three centre pins at the front are for the leads from the transformer secondary, while the two outer pins are used for parallel 'common' connections to the vertical PCB.

After the pins are fitted, it's easiest to fit the 12 rectifier diodes next, and then the electrolytic caps. Note that both the diodes and the capacitors are polarised,



Above is the overall wiring diagram for the supply, including the mains wiring. Make sure to fit heatshrink or similar sleeving over all active and neutral connections, to prevent accidental shocks.



Right: How the horizontal PCB is mounted close behind the metal rear panel, and the regulator ICs fitted with their leads cranked to line up behind the PCB terminal pins. Solder the leads to the pins only after the mains wiring is completed.

and should be fitted as shown in the overlay diagram. Also take care in fitting the 2200uF electros — the two 16VW types should be fitted as C1 and C2, and the four 25VW types as C5-C8.

At this stage the horizontal board is essentially finished, because the regulators are only connected during final assembly. The board can therefore be put aside while you prepare the rear panel.

In order to provide reasonable heatsinking for the four regulator ICs, the rear panel should ideally be made from 2mm-thick aluminium sheet. I didn't have this available, but instead used two pieces of 1mm sheet 'in parallel'.

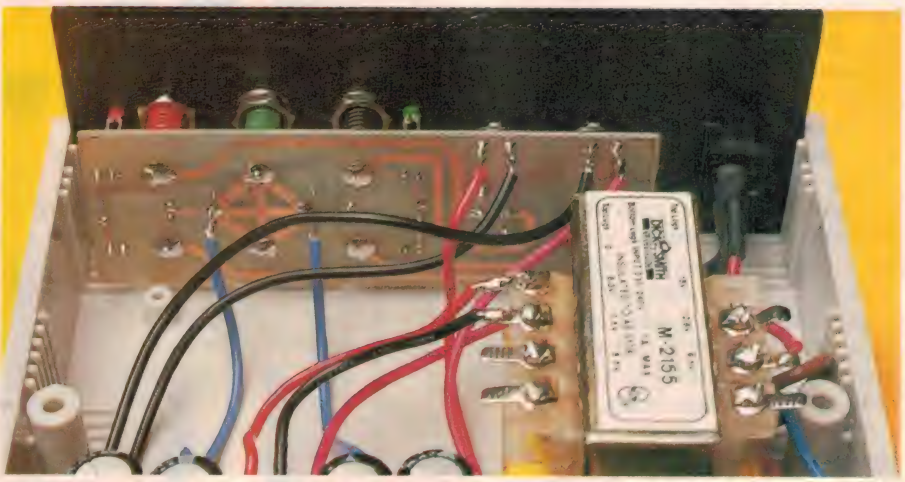
The main holes to cut are those for the IEC mains plug and the cartridge fuseholder, which are aligned vertically on a line about 25mm from the left-hand end (looking from the front). This leaves most of the panel free, as a heatsink. The mains plug holder involves the most work, as it is rectangular with two 'chamfered corners' — and also has a 3mm hole on each side for the mounting bolts, of course. I suggest you do as I did, and use the plug itself as a reference for the exact hole dimensions.

The exact location for the four 4mm holes used for mounting the regulator ICs is best left until you finish the next phase of construction. This is to work out the best locations for the power transformer and horizontal PCB, and then mount them in place in the lower half of the case.

As you can see from the internal photos, the power transformer is mounted as far over as it will go comfortably on the left-hand side of the case (looking from the front), but essentially midway between the front and rear panels. Space it only just far enough away from the left-hand side to ensure there's no chance of the case assembly pillars fouling the transformer lugs or connections when the top of the case is fitted later. When you're happy that you've found this position, mark the mounting hole positions and drill them.

Then fit the transformer temporarily, and also temporarily slip the rear panel into its 'slot'. This will allow you to offer up the horizontal PCB assembly to it, in the position shown in the photos. The rear edge of the board should be no more than 1mm inside the rear panel, and the board located laterally so it's reasonably centred between the power transformer and the right-hand end of the case.

You should now be able to mark the positions for the four holes which will take the mounting screws for the 10mm insulating pillars used to support the horizontal PCB. You'll probably find that you need to trim off a short section of the moulded ribbing, in order to provide mounting clearance for the rear pillars (and also make it easier to drill these holes). I suggest that you countersink the underside of these holes, and also the two mounting holes for the power transformer.



Another view inside the case, this time showing the vertical board fitted behind the front panel. Note the sleeving on the mains switch connections.

You should now be able to mount both the power transformer and the horizontal PCB in the lower half of the case. I substituted 3mm metric thread by 5mm long countersink-head screws for the round-head screws normally supplied with the 10mm insulated spacers, to give a neater job.

Take care to use 'star' lockwashers under the mounting nuts for the power transformer, to ensure that it remains reliably fastened. Then fit a further lockwasher on either side of the solder lug you fit to the rear mounting bolt, plus a further nut — to ensure that the solder lug will remain electrically connected to the transformer frame.

With the transformer and horizontal PCB mounted in the case, you should now be able to determine the correct positions for the four regulator IC mounting holes, in the rear panel. I did this by carefully bending the leads of one regulator first upwards at about 45° (just where they become narrow), and then down again by 45° (so they become parallel to their original plane), about 5mm further down — see diagram. I then used it as a jig, to determine the correct lateral position for each regulator (i.e., in line with each trio of pins on the PCB), and vertically (so that the lower sections of the regulator leads sit alongside the pins).

Once the hole locations have been marked on the rear panel, they can be drilled and carefully de-burred. The four regulators can then be fitted to the panel, after the remaining three have had their leads cranked in the same way as the first. Use the correct insulating bushes and mica or plastic washers (smeared with silicone grease) as shown in the diagram, and remember to mount them in their correct locations (7805 far left, then the 7812, then the 7912 and finally the 7905 at far right, all looking from the front).

It's important to ensure that all four regulators are insulated from the panel

Parts List

Resistors

R1,2	470 ohms 1/4W
R3,4	1.5k 1/4W

Capacitors

C1,2	2200uF 16VW RB electro
C3,4,9,10	100uF 16VW RB electro
C5,6,7,8	2200uF 25VW RB electro

Semiconductors

D1-12	1N4001 or similar 1A diode
LED1,3	3mm red LED
LED2,4	3mm green LED
U1	7805 +5V regulator (TO-220)
U2	7905 -5V regulator (TO-220)
U3	7812 +12V regulator (TO-220)
U4	7912 -12V regulator (TO-220)

Miscellaneous

T1	12.6V/1A power transformer
SW1,2	DPDT miniature toggle switch
SW3	SPDT illuminated rocker switch, 240V rated
F1	250mA cartridge fuse in holder

Plastic instrument case, 155 x 160 x 64mm, with metal rear panel (2mm aluminium, ideally); two PC boards, one 70 x 63mm coded 98ps1a and the other 108 x 39mm coded 98ps1b; two red, two black and two green banana jack terminals; IEC captive mains plug; 27 x PCB terminal pins; four insulated mounting kits for regulator ICs; four 10mm-long insulated mounting pillars; four M3 x 12mm countersink-head screws, with six M3 nuts and seven star lockwashers; four M3 x 5mm countersink-head screws (PCB pillar mounting); four M3 x 10mm round-head screws and nuts (regulator mounting); two solder lugs; mains-insulated wire; low voltage hookup wire; solder, etc.

itself. In fact when you have fitted them all, it would be a good idea to check with a DMM or ohm-meter to ensure that there's no continuity between any of the regulator leads and the panel.

Don't solder the regulator leads to the PCB pins yet, though, because this operation is better left until you've completed the mains wiring. You can mount the IEC plug and mains fuseholder to the rear panel, though, using star lockwashers under both nuts for the plug, and making sure that you fit a solder lug and second lockwasher underneath the nut on the regulators side.

The basic mains wiring should be clear from the wiring diagram. Note that two short lengths of mains-insulated wire with green or green/yellow striped insulation should be used for the protective earth wiring: one to connect the centre earth pin of the IEC plug to the solder lug on the mains transformer mounting bolt, and the other to connect the rear panel earthing lug to the same transformer lug.

There's no need to fit heatshrink or other insulating sleeving over these earth lead connections, but this should definitely be done to protect ALL of the other mains connections when they're done (including those to the transformer primary lugs). Note too that mains-insulated wiring with the correct colour coding should be used for this wiring: brown or red for the active wires, and blue or black for the neutral wiring.

The rear of the supply is very plain, with just the mains inlet and fuse visible.

Take care to fit and wire the illuminated mains switch correctly, by the way. You'll note that two of the lugs have small wires disappearing into the switch body, for the inbuilt neon. The switch should be mounted on the front panel so that the remaining 'no wire' lug is at the top of the panel, and is connected to the active lead from the fuseholder (see diagram).

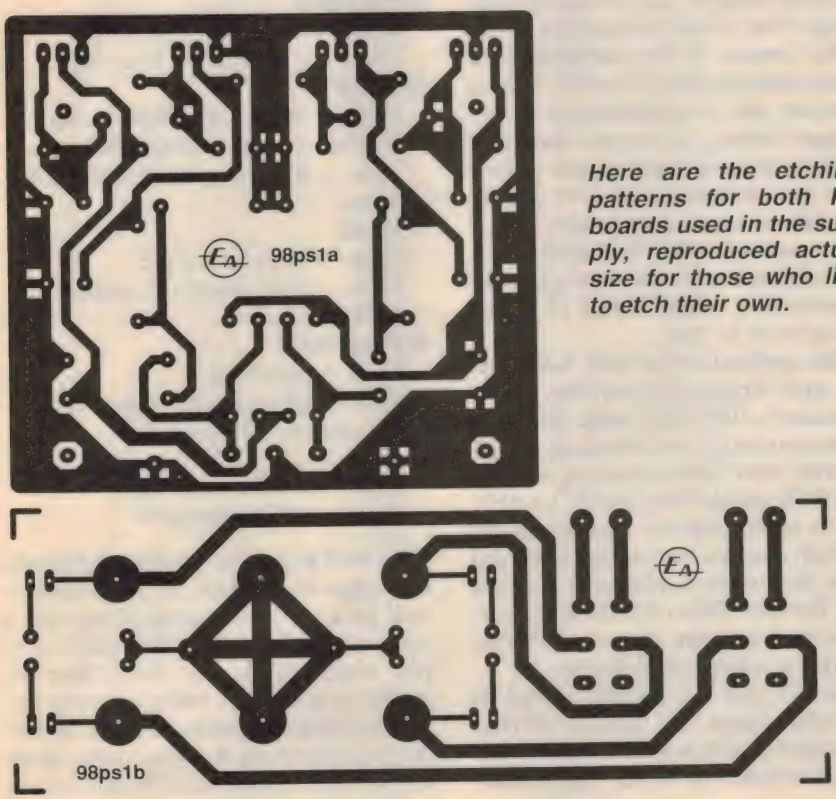
One more point, in the interests of safety: make sure you connect the active wire from the IEC plug to the rear axial lug of the fuseholder, and the fuseholder's side lug to the front panel switch. This reduces the risk of shock if anyone tries to replace a fuse cartridge with the power cable still connected.

Please ensure that you follow all of these safety precautions carefully — *EA* needs to keep all of its readers!

Once the mains wiring is completed, and all heatshrink sleeving applied, you should be ready to fit the front and rear panels into their slots and finish the low voltage wiring. The first step is to ensure that each regulator's cranked leads are located just behind their corresponding PCB terminal pins, and then carefully solder them to the pins — taking care not to cause overheating, or produce solder bridges.

The three leads from the transformer secondary to the horizontal PCB can be fitted next, taking care to connect the centre 'CT' pin of the PCB to the effective centre-tap of the 12.6V section of the winding. With most 2155-type transformers this will be the '6.3V' tap, with the other wires going to the '0V' and '12.6V' taps.

The final wires are those that connect between the horizontal and vertical PCBs. The two 'COM' pins at the front of the horizontal board connect to the pins behind the output terminals, while the four supply outputs connect to the four pins above SW1 and SW2. Use the wiring diagram as a guide to ensure you fit these correctly.



Here are the etching patterns for both PC boards used in the supply, reproduced actual size for those who like to etch their own.

Checkout

If you've followed these instructions fairly carefully, your supply should work correctly as soon as you connect it to the power. Checking the four outputs with your DMM should give readings within a couple of millivolts of +5V, -5V, +12V and -12V — all measured against the green 'COM' terminals.

About the only possibilities for error are fitting the electros or diodes incorrectly to the horizontal PCB; mounting the regulator ICs in the wrong order on the rear panel; connecting the LEDs into the vertical PCB the wrong way around; or making a mistake in your connections between the boards and/or transformer. So if your supply doesn't seem to work properly, these are the things to check after quickly switching off.

Otherwise, you'll have just finished making yourself a very handy little four-in-one bench supply. All that should remain is fitting the top of the case, and putting it to use. ❖

Construction project:

FLEXIBLE COUNTER MODULE

If you've ever wanted to fit a digital readout to your latest project, or needed a flexible counter module that could be easily expanded and modified to suit, then this little project should fit the bill nicely. Using a simple 'sandwich' technique, this counter module takes up a minimum of space on the front panel, and you can extend the count to as many digits as you like by simply adding extra units.

by GRAHAM CATTLEY

It's been quite a while since we've presented a general purpose counter unit, and looking back at past designs we realised that there wasn't really anything that offered a degree of flexibility in the number of digits, while also providing an aesthetically pleasing display. Most designs provide three digits, but if you wanted to add more, there was no way to link on the next unit and still maintain an equal spacing between each of the displays.

To make matters worse, supplies of the much-loved 74C926 counter and seven-segment driver IC that was used in a lot of earlier designs have dried up, leaving many previous designs now unbuildable. All of this highlighted the need for a flexible counter module that was small and expandable, but still offered a goodly number of control inputs to make it easy to adapt to new and existing designs.

Although a little unconventional in design, this counter module can be easily expanded to as many digits as required. A full range of control inputs is available as well, making this module suitable for use in existing designs.

Features

With this new design, each digit is completely independent of any other digit, and so the modules can be cascaded to give anything from three to 30 digits, and can even be cut down to give two digits (or even one) if required.

Each digit has a full complement of control inputs, including lamp test, blanking, output latching, up/down counting, input gating, reset and clock. As well, the design uses standard CMOS, and so will run off a wide range of supply voltages.

With minimal additional circuitry the counter could be expanded to count up to millions of events, or with a suitable front end and gating circuit it could be the basis of a simple frequency meter.

The circuit

As you can see from the schematic, the circuitry behind each of the three digits is identical, and so I'll just cover the operation of the first digit here, based around IC1 and IC2.

Most of the work in this circuit is done by the 4029 counter IC. This IC is very flexible, and can be configured to count in a number of different modes by tying the relevant control pins high or low. IC1 drives the right hand (least significant) digit on the display, and clocks on a rising edge from whatever circuitry is driving the counter. If the counter is to be clocked mechanically (a switch contact or pressure mat for example) the incoming signal driving the counter should be suitably de-bounced, and its peak voltage should be clamped so that it doesn't exceed the counter's supply rails.

IC1's output is a four-bit binary word, which (depending on the configuration) will count to a maximum of 15 before resetting back to zero.

In this application we only want it to count up to nine before resetting, and so the counter's BIN/DEC input (pin 9) is held permanently low, selecting a decimal rather than binary counting mode.

The BCD output feeds into IC2, a 4511 BCD to seven segment decoder driver IC, which decodes the four bit word and outputs the correct display code for each count. Resistors R6 to R13 limit the current to each segment to around 20mA, which gives a nice bright display.

Both IC1 and IC2 support a total of five control inputs, and these are all held in their inactive or 'normal' states by the five 10k resistors R1 to R5. The following list describes the function and effect of each of these inputs.

- **Up/Down**
  High — counts up from 000;
  Low — counts down from 000.
- **Latch**
  High — freezes the display only, with the counter still enabled;
  Low — display updated with each count.
- **Blank**
  High — digit turned on;
  Low — digit turned off, counter still enabled.
- **Lamp test**
  High — no effect;
  Low — all segments of digit turned on, counter still enabled.
- **Gate**
  High — counter enabled;
  Low — counter stopped.

As well as the five inputs listed above, each digit has a clock and reset input as well as a carry-out output. Carry-out is connected to IC1's TC (Terminal Count) pin, which pulses low every time the counter reaches nine (when counting up) or zero (when counting down). This output is used to clock the next counter in the module (here shown as IC3) and acts as a

carry out for each digit. By chaining the clock input of each module to the carry-out output of the proceeding digit, any number of counter modules can be added.

One aspect of the counter's operation that may not be immediately apparent is the reset circuit. The 4029 doesn't have a reset as such, and instead this function relies on one of the more specialised features of the IC. It's called *parallel load*, and the idea is that the counter can be pre-loaded with a value, and counting will continue from there. In this case, all the parallel load inputs (or 'jam' inputs as they are known) are tied to ground, and the parallel load input (pin 1) is used as a reset as it simply loads a value of zero into the counter. The reset control line is tied low (inactive) by R40.

I might just note that I have shown separate pull up/down resistors for all the control inputs for each digit. As most of these inputs are paralleled in normal operation, resistors 14, 15, 17, 18, 27, 28, 30 and 31 are not installed in the standard three-digit assembly. They would normally only be fitted to one digit logic board.

Construction

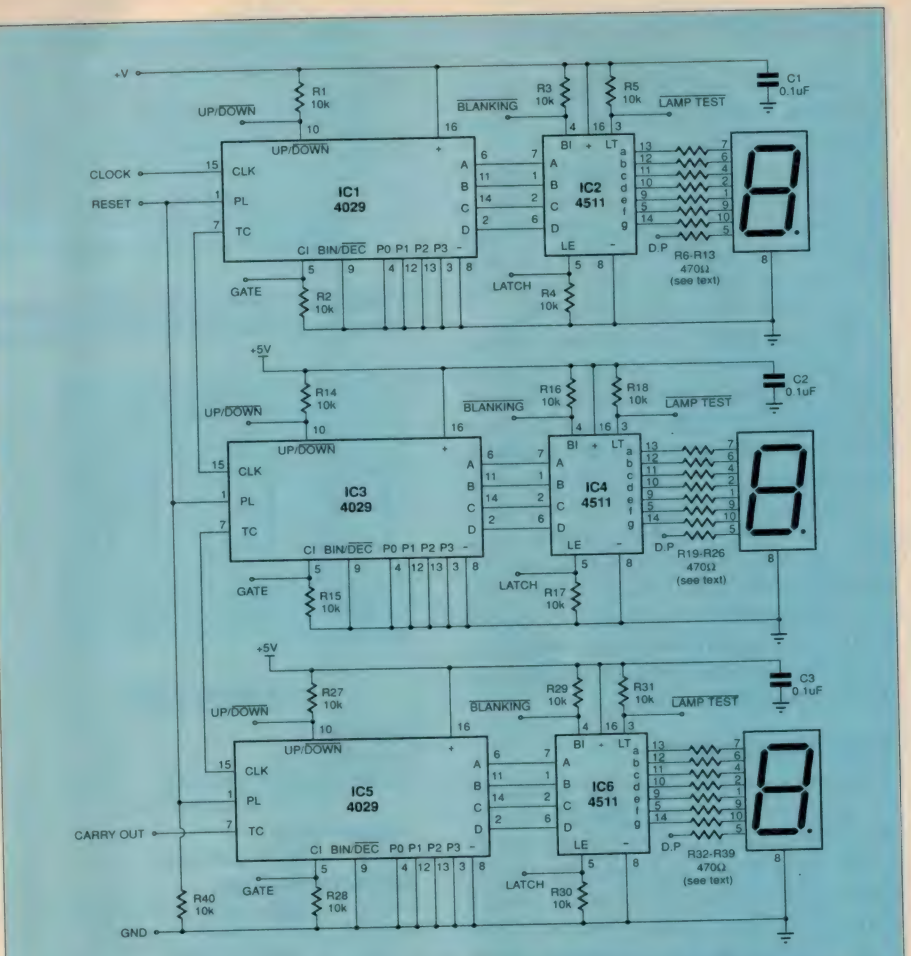
The photos give a pretty good idea of the construction technique, with the three logic boards mounted on edge behind the main display board. This system is perhaps a little unconventional, but it results in a compact unit with only a 0.1" gap between each of the displays.

While the counter isn't difficult to assemble, it's worth following the order of construction described here, as it can be a bit tricky getting into the logic boards once they have been soldered in to position.

To start, you will need the small main display PCB as well as three of the slightly longer logic boards. (I am assuming that you will be building the three-digit counter as shown in the photos. I'll cover the construction of modified boards for different numbers of digits later on...)

Although the three logic boards are identical, only one set of 10k resistors is needed per counter, and you'll only need PCB terminal pins on one of the boards as well.

With this in mind, the best place to start is by installing the components common to all boards. Start with the link, the 0.1uF monoblock and two PCB pins — one for blanking (located in the centre of the board) and the other for each display's decimal point. If you are going to perform blanking on an individual digit basis (leading zero blanking for example), you should also install R3, R16 and R29 as these will aid testing of the counter module as it is being constructed.



As you can see, the circuitry for each digit is practically identical. Note that the pull up/down resistors have been shown on every control input for clarity. Only one set should actually be installed.

You can now mount the eight dropper resistors on each of the three logic boards — Table 1 lists the correct value to use for whatever supply voltage you'll be using. Lastly, install all the ICs, with the 4511 mounted next to the column of resistors, and the 4029 at the end of each board.

Table 1

Resistor values	
5V	220Ω
9V	470Ω
12V	560Ω
15V	680Ω

Now select one of the boards, and mount on it the five remaining 10k resistors. Pick another board and install the five PC pins for V+, reset, clock, gate and ground. Note that this leaves the carry-out pad free, along with a couple of extra pads for power and reset.

You can now move on to the display board, where it is probably easiest to start by installing the three nine-way SIL header strips. These can be cut down from one 28-way strip, and are inserted 'upside down' in the PCB so that around 4mm of pin protrudes from the copper side of the board. This leaves the plastic strip and the short ends of the pins sticking up on the component side of the board, but these won't be noticed once the displays are soldered in.

Once the SIL strips are installed, you can mount the displays. These should just fit nicely between the plastic pin header strips, but before soldering them in, double check that they are the right way up — the decimal points sit at the bottom, with each of the header strips to the *right* of each display.

Now comes the fun bit — soldering each of the logic boards to the display board. Before we do that though, we'll need some lengths of tinned copper wire to run between the boards. You'll need seven 50mm lengths of straight bare wire, and these are inserted from the copper side of the logic board that contains the extra resistors. Leave around a millimetre protruding out of the component side of the board, and solder them

to the following (unoccupied) pads: Up/down, Latch, Lamp Test, V+, Reset, Gate and Ground.

If your application is going to support leading zero blanking, it would be a good idea to attach leads to the 'Blank' pin on each board now, as it's a little difficult getting to this pin once all the boards have been soldered together.

With the tinned copper wires poking up from the bottom of the first logic board, position the nine copper fingers along one edge of the board so that they line up with the nine pins belonging to the *left hand digit* of the display board.

Just tack solder a couple of the pins, and then check that the two boards are correctly aligned, and are sitting at 90° to each other. Also double check that you have actually connected it to the left hand (most significant) digit, otherwise you'll find it rather difficult to solder in the remaining two boards...

Testing, testing

If all's well, you can fully solder all the pins, and the first digit should be complete. As a test, try applying power to the logic board and checking that it lights up correctly, and counts at around 50Hz if the clock input is touched with a wet finger (you can, of course, use a signal generator instead, but wet fingers are usually closer to hand, so to speak).

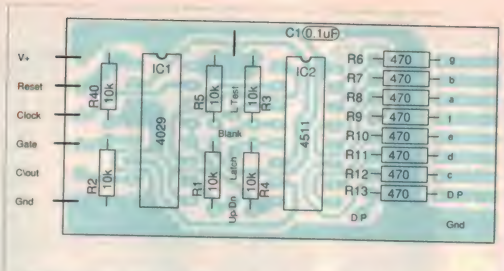
With the left-hand digit working, you can now mount the second logic board to drive the middle digit. Carefully thread the board over the tinned copper wires, making sure that each wire goes through the correct hole — some holes are unused on the second and third boards, so it pays to be careful.

Position the fingers with the pins as before, and again check that everything is at right angles before soldering it in place permanently.

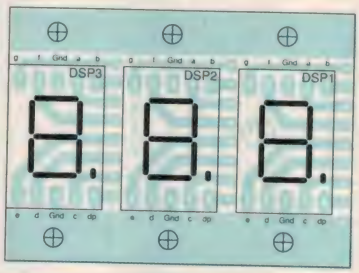
Check again that this second digit counts in the same way as the first, and then link this second board's carry-out pad to the first board's clock pad with a short length of tinned copper wire. You should now find that you can clock the middle digit at 50Hz as before, and the first digit will clock at a tenth of the speed (5Hz). It's a good idea to follow this check-as-you-go procedure, as finding faults after all the boards have been wired together can get a bit fiddly.

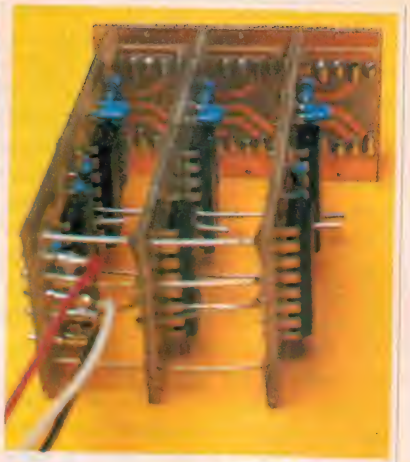
The last board is connected in the same way as the second; this one should have the extra PC pins on it, and once it has been connected to the display board and the feed throughs soldered in you can then connect its carry out to the clock input on the middle board.

All three digits should now light up when power is applied, and they should count from 000 to 999, with the last (left) digit incrementing every 0.5Hz, or once every two seconds.



Component overlays for both the logic board (above) and the display board at bottom.





This shot shows how feed through links are used to connect between boards. All off-board connections are made to the board driving the right hand digit.

PARTS LIST

Resistors

R1-R5,R40 10k
R6-R13, R19-R25, R32-R39 470 ohms (see text)

Capacitors

C1-C3 0.1uF monolithic

Semiconductors

IC1,3,5 4029 CMOS BCD counter
IC2,4,6 4511 CMOS 7-segment decoder/ driver
DSP1,2,3 FND500/5303 or equiv. 13mm common cathode display

Miscellaneous

PCBs — 1 x 98cm01a (46 x 28mm), 3 x 98cm01b (56 x 28mm); 1 x 28-way SIL header strip; 9 x PC pins; 400mm tinned copper wire; hookup wire, solder etc.

Extra digits

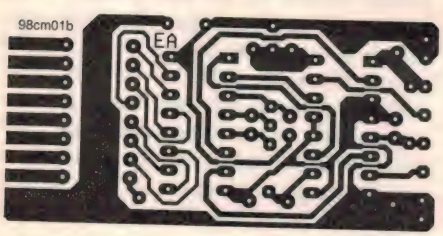
If you want to extend the counter to give four, five six or more displays, then it is a simple matter to repeat the above procedure for as many digits as you want. You can trim off any excess display board and mount the extra module(s) to the right of the original displays. You may find it easier to construct and test each module as a separate unit, and then wire them together with hookup wire, rather than trying to construct a 'mini skyscraper' on the bench...

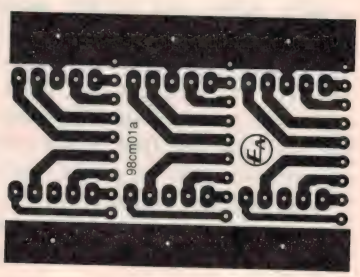
Only one set of pull up/down 10k resistors will be needed no matter how many digits you have, so it's probably best to leave them on the first module and omit them from all the others.

To make it easier to physically align more then one display board, the top and bottom edges of each of the display boards have a wide copper track running along them. This track can be used to hold a 10mm long piece of stout wire soldered between the two adjoining display boards, which will keep them lined up.

To mount the display in your case, you are probably best off enlarging the mounting holes on the top and bottom of the display board to accept some M3 x 15mm countersunk screws. You can then use four 10mm spacers to mount the module behind a rectangular cutout in the front panel, covered with clear red perspex or other suitable filter material. ❖

Full sized artwork for both boards. You will need one logic board (below) for each digit in the display, making a total of four boards per module.





Product review:

BUBBLE TANK FOR PCB ETCHING

You've probably seen them before, but until now they were pretty hard to find. Yes, they're the old bubble etching tanks, and you can now get them at your nearest Dick Smith Electronics store. All very well you say, but do they work? Sure do — in fact the one we tried seems to have solved a number of problems we were experiencing in making our own boards.

by GRAHAM CATTLEY

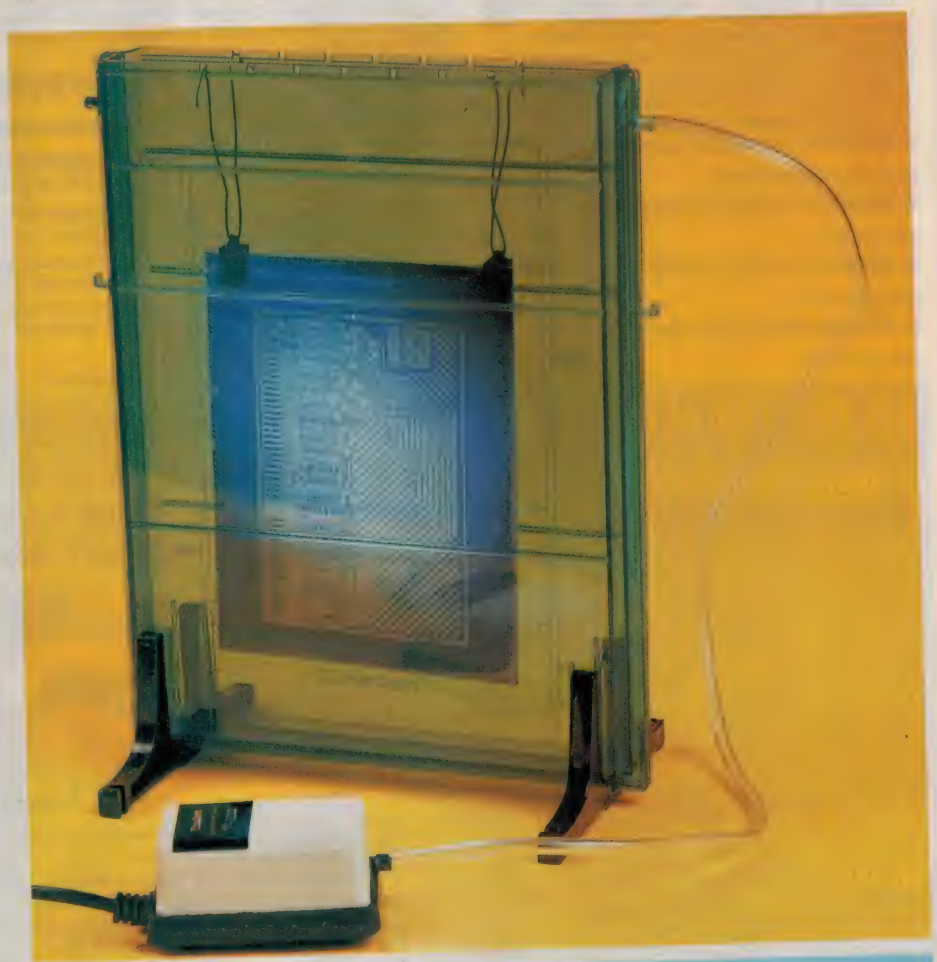
As you may know, we usually make our own PC boards here at *Electronics Australia*, and for years we had been getting good results with the standard red Riston photosensitive PCB laminate. Things started going wrong however, when our supplier changed over to the new blue Riston board. Problems with under-cut tracks, some areas refusing to etch properly, while other parts of the board would be eaten away entirely...

Clearly, we needed to review our board making procedure, and perhaps upgrade our somewhat well-worn equipment. By sheer coincidence (serendipity?) it was at this point that Dick Smith Electronics came up with their bubble etching tank and asked if we would like to review it. *Yes please!* we replied, and so we immediately put it to work on the latest batch of boards.

The tank measures 300 x 240 x 35mm (H x W x D), and can hold 1.5 litres of etchant. Molded into the seal that joins the front and back plastic panels is an airtight channel that extends down one side of the tank and then continues along the bottom. The channel has an air inlet at the top end, and is perforated along its run at the bottom of the tank. A small aquarium-type air pump (available for around $10) forces air through the channel, which then escapes through the small holes and rises up through the etchant to provide a constantly agitated and aerated solution.

We received a pump along with the tank, which also included around half a metre of plastic tubing to connect the two. Also included were some plastic PCB clips, and a couple of lengths of coated wire that are used to support the board in the etchant.

And the results? Well, the most dramatic improvement is the much reduced etching time. Obviously the other changes we made to our board production setup had an effect too, but the new tank made etching much faster and easier. There was a nice, even distribution of bubbles along the width of the tank, and the tank was surprisingly stable on its two clip-on feet.



The only drawback we found was a tendency for the etchant to bubble up and splatter the surrounding counter top, if more than a 1.25 litres was used. If you are looking at using this sort of amount of etchant (for bigger boards) I would suggest that you use some form of lid to protect the immediate area.

All in all it was quite a success — We're turning out perfectly etched boards now, and we intend to use the bubble etching tank from now on. Thoroughly recommended! ❖

PCB bubble etching tank

Good points: Works well, good agitation of the etchant solution.

Bad points: Tends to spatter etchant if filled to within 50mm of the top.

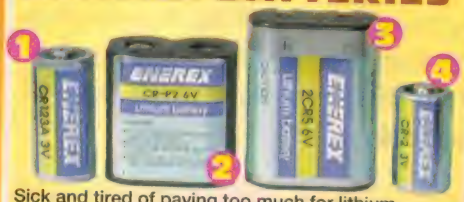
RRP: $49.95. An aquarium air pump is also available for $10.00.

Available: At all Dick Smith Electronics stores. For further information ring their head office, phone (02) 9937 3200 or fax (02) 9888 3631.

Jaycar ELECTRONICS JANUARY SALE 98

Prices valid until January 31st.

NEW LITHIUM 35mm SLR CAMERA BATTERIES



Sick and tired of paying too much for lithium batteries? We were, so we've done something about it. We have the 4 most common types available. Continuous max current drain for all 4 is 1A. Nominal capacity is 1300mAH.

1. CR123A: 3V (replaces EL123AP, K123LA and DL123A) Cat. SB-2400 **$9.95**

2. CR-P2: 6V (replaces EL223AP,K223LA,DL223A) Cat. SB-2401 **$17.95**

3. 2CR5: 6V (replaces EL2CR5, KL2CR5 & DL245) Cat. SB-2402 **$17.95**

4. CR2 (replaces ELICR2, KCR2 and DLCR2) Cat. SB-2404 **$9.95**

ACTIVE SUBWOOFER AMPLIFIER MODULE

Our new Active Subwoofer Amp Module will deliver 150W RMS into 4Ω and 100W RMS into 8Ω. Its the easy way to add a subwoofer to your existing stereo/ home theatre Hi Fi system. It includes both high and low level inputs/outputs, phase reversal switch, volume control, auto on/off which is activated by input signal and an electronic low pass filter that is continuously variable from 40 - 100Hz.The amplifier runs the right and left stereo inputs to a mono output, so that only one amp is required per system. Operates on 240V. This unit is designed to fit into the back of most subwoofer cabinets. A simple 190 x 240mm cutout is required. Hardly any internal volume is lost.

Specifications: •Output Power 150W RMS 4Ω/100W RMS 8Ω •Distortion 0.05% •S/N Ratio >75dB •Turn Off Delay Time 15-20 Min •Input Sensitivity Line In 9mV @ 1W/8Ω/Speaker In 320mV •Line Output Freq Resp: Low 100-120Hz / High >25KHz •Input Impedance: Line In 47KΩ •Speaker In 200Ω

Cat. AA-0500 **$299**

SUBWOOFER AMP DEAL

Subwoofer Amp Module Cat. AA-0500 **$299**

10" Subwoofer Cabinet Kit Cat. CS-2532 See Cat P54. **$99**

Re/Sponse 10" 4Ω Carbon Fibre Woofer Cat. CS-2244 See Cat P59. **$149.50**

This Woofer outperformed most tested in Hot 4's sub car test, & most others were double the price. See Cat P59. **$547.50**

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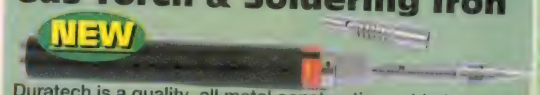
BUY TOGETHER & SAVE $48

DURATECH GAS TORCHES

Gas Torch & Soldering Iron



Duratech is a quality, all metal construction soldering tool. It runs on Butane gas, therefore needs no cords or mains power, and can be used anywhere. Adjustable 10 to 60 watts and uses standard Butane cigarette lighter gas. Supplied with a flame tip for welding, shrinking heatshrink tubing etc and a solder head! It can achieve a flame temperature of up to 1300°C and a soldering tip temperature to 400°C. When fully fuelled, operating time is approximately two hours for soldering and one hour for the torch. Supplied with flame torch tip and conical soldering tip/catalyst. Cat. TS-1685 **$34.95**

5 in 1 Gas Soldering Iron Kit

This kit uses the same tool as shown above. The assessories supplied in the kit give it a much larger range of uses. The kit includes: •The tool with metal body •Soldering head and catalyst •5 soldering tips: conical, 2.5mm diagonal, 3.5mm diagonal, 3.5mm chisel, 7mm chisel •Pencil flame head, hot knife head, hot blower head, flat flame head •Solder sponge •Tube of solder •Case to hold everything

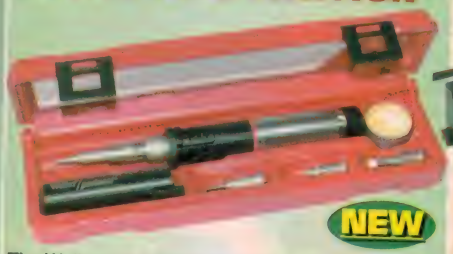
Cat. TS-1690 **$59.95**

Piezo Micro Torch

Features include: •Self igniting •Easy to Refill •Adjustable flame •Portable •Cordless •1300°C •Butane Gas Powered Ideal for welding, brazing, wire soldering, jewellery, shrinking heatshrink, plumbing, hobbyist use.

Cat. TS-1675 **$44.95**

Weller portasol PROFESSIONAL 100K SOLDERING IRON KIT WITH PIEZO IGNITION



The Weller PSI-100K is an extremely robust soldering tool kit, which is ideal for trades people and serious hobbyists. It features a heavy duty stainless steel gas tool with piezo self start ignition, large gas tank with viewing window, fully adjustable temperature from 25W to 125W, instant heat, auto switch off, 2 hour average use on one tank, antistatic and iron plated soldering tips. Kit includes: •Soldering tool and cap •Soldering tip 3.2mm chisel •Soldering tip 4.8mm chisel •Hot blow tip •Hot knife tip •Sponge and holder •Case

Cat. TS-1730 **$159**

EXTRA SOLDERING TIPS AVAILABLE

1mm Single Flat Cat. TS-1732

2.4mm Single Flat Cat. TS-1734 **$22.95ea.**

Weller WTCPT SOLDERING STATION

The Weller station is known as one of the best soldering stations around. It's made in Australia and features a 48W heating element. To change the temperature, simply change the tips! Other features include non-burning silicon rubber tool cable, the tool base which can be mounted either side of the unit which includes a water well that wick feeds the sponge. Supplied with a 1.6mm PTA7 screwdriver tip. The ultimate for the professional or serious hobbyist. Cat. TS-1350 **$189**

TIPS TO SUIT

Plato brand. Suitable for WTCPN/S/T stations. All tips 1.6mm screwdriver type.

Cat. TS-1352 PTA6 - 315°

Cat. TS-1362 PTA7 - 370°

Cat. TS-1365 PTA8 - 430°

All $8.95 each

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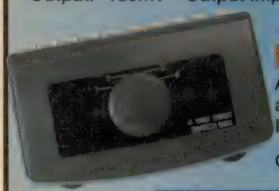

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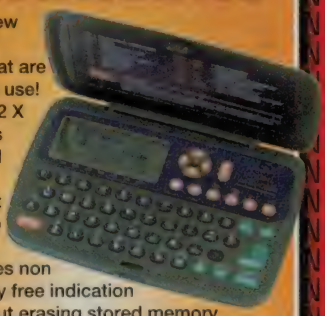

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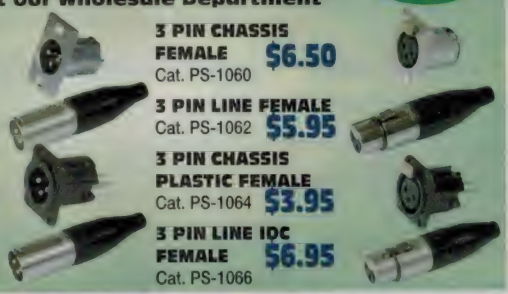

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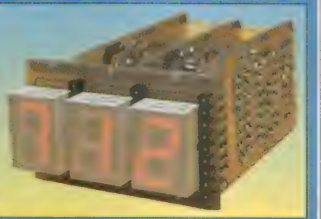

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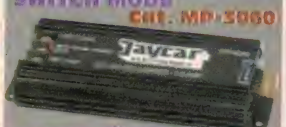

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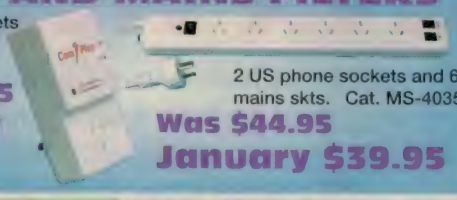

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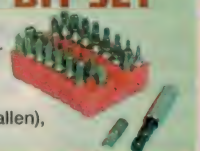

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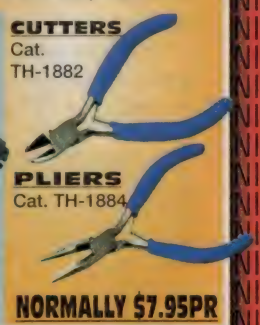

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Construction Project:

A SPLITTER FOR VGA/SVGA VIDEO

Using this low cost but high performance video graphics signal splitter, you can display a computer's VGA or SVGA video signal on both a local monitor and a remote large-screen monitor or data projector — making it ideal for classroom, lecture theatre or boardroom situations. The remote display can be up to 60 metres away (with the right cable) and can also be blanked easily, while still keeping it in sync.

by JOE RAINE

If you have ever needed to connect more than one display device (monitors, data projectors, scan converters, etc.) to a computer, you will know how difficult and expensive that seemingly simple act can be. There are many situations in which more than one display can be extremely useful. In the classroom, software-based teaching is much easier on a big monitor or data projector facing the students, while the teacher looks at their own screen. The ability to 'black-out' the students' picture is also very useful, whilst an important point is stressed or when programs are changed or files loaded. Similar advantages are to be had in the corporate boardroom, audio visual installations, seminars, software demonstrations, monitor comparisons and so on.

You may have tried simply connecting two monitor cables to the same output using a 'Y' cord, which just connects them in parallel — but this causes dim pictures and other problems due to signal overloading and the complex nature of high frequency cabling.

Many of the newer data projectors have an extra output which can drive a monitor, which is fine over a couple of metres. But if you have a long cable run of say, 20 metres or more, then that length is automatically doubled if you want to connect all the way back to a monitor. Video graphics cables are expensive, so it makes sense to distribute two signals from a point near the computer and its monitor, so at least the monitor cable will be short.

There are commercially available graphics distribution amplifiers and computer interfaces to do all this, but they are usually quite pricey and often quite difficult for the uninitiated to set up.

The video graphics splitter to be described here is small, inexpensive and easy to use. It uses a minimum of special components and is easy to construct. It has been designed to be able to operate from a nominal 12V DC supply, for operation from a plug pack or a 12V battery.

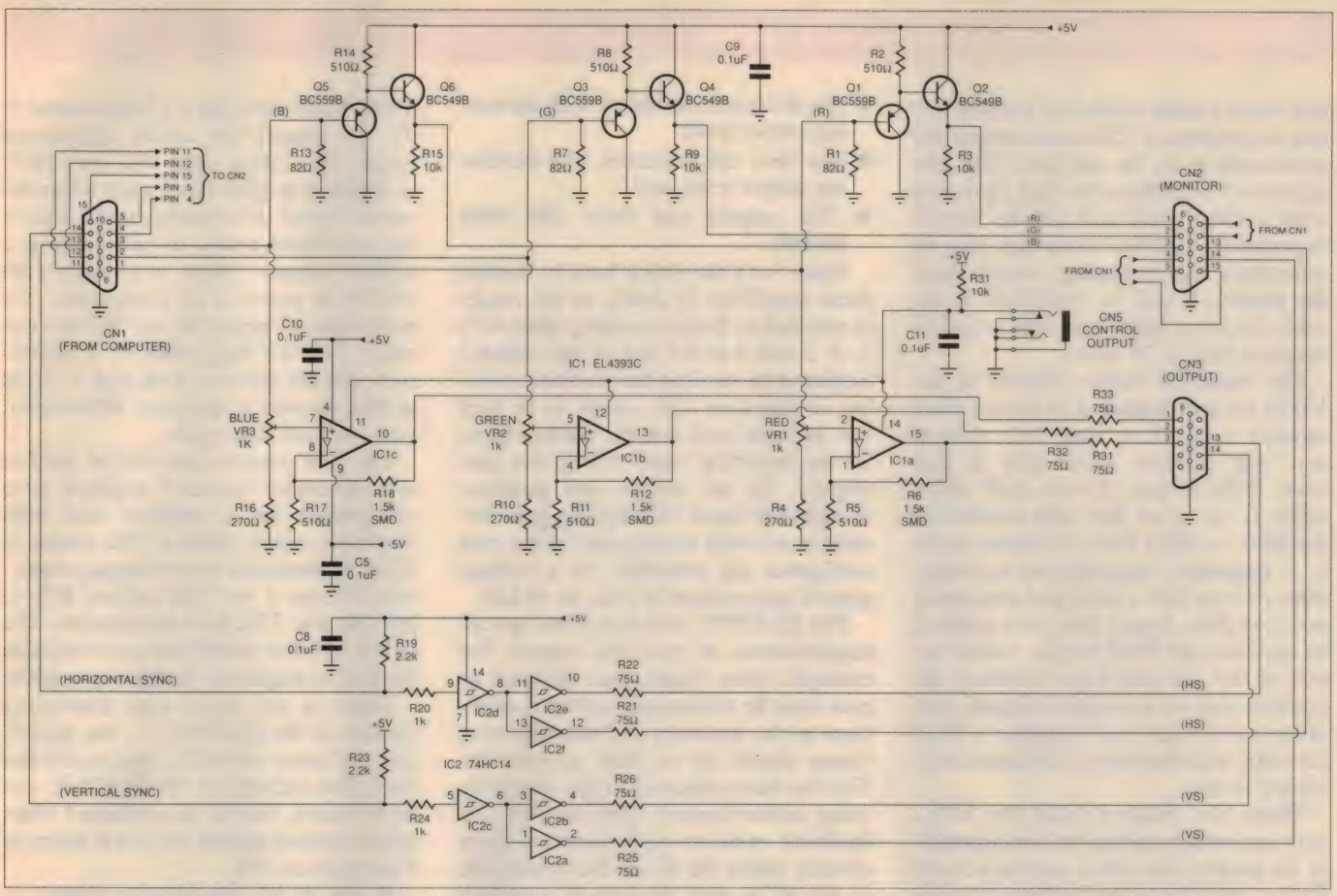
Technically, the VGS2, as it has been named, is a very high performer which is fully capable of being used with the highest practical display resolutions. It has been tested up to 1600 x 1200 pixel SVGA and the output looks just great!

It is directly compatible with VGA-type outputs as it uses the same type of connectors and pinout. It can also be used equally well with 'Amiga', 'Mac' and 'Sun' outputs, but will require adaptors to do so. Note that such adaptors are not the subject of this article.

What it does

To begin, what is (are?) computer graphics? There are two types of signals which make up a modern computer signal:

The rear of the splitter is very businesslike, with the input from the computer at far right, the output for the local monitor in the centre and the 'long cable' output on the left. It runs from a 12V DC power pack.



Here's the schematic for the signal processing part of the splitter. The lower section around IC2 handles the sync signals.

1. The Red, Green and Blue analog video, which consists of three wide-bandwidth, linear signals of amplitude 0V to +700mV peak which extend essentially from DC to at least several tens of MHz and up to several hundreds of MHz depending on the actual resolution, picture content, horizontal scan rate and vertical refresh rates; and
2. The TTL horizontal and vertical synchronisation signals, usually between about 30kHz to 120kHz (horizontal) and 50Hz to 150Hz (vertical).

The high resolution pictures we see on today's computer monitors are possible because these five signals are kept separate at all times, and occupy quite enormous bandwidths compared to domestic video (e.g., PAL or NTSC). Unlike PAL or NTSC video, these signals are difficult to 'broadcast' so special equipment, cable and techniques are required if their clarity and detail are to be preserved.

Circuit description

Let's look at the circuit in general. The video output from the computer is connected to CN1 and passes to several amplifying stages, before being sent to the Monitor connector CN2 and Output connector CN3. If you take a look at the circuit diagram, you will notice the repetitive nature of the building blocks.

The three transistor buffers are for the red, green and blue (RGB) analog signals to be sent to the local monitor, while the three adjustable op-amp sections are for the additional RGB outputs which can feed very long cables (depending on the type of cable) and can also be 'blacked out' without affecting the remote monitor's sync. The logic circuitry around IC2 separately buffers the sync signals to be fed to the monitor and the additional output.

Power is supplied from a monolithic regulator IC, providing a tightly regulated +5V rail which powers most of the circuit. A negative voltage source based on a 555 timer and inductive flyback generator produces a -5V supply for IC1.

Now for more detail. Looking at the Red buffer constructed from Q1, Q2 and R1, 2 and 3 you may be confused by the unusual arrangement. The Red signal from the computer (CN1, pin 1) is connected directly to the base of Q1, a PNP emitter follower. R1 forms most of the 75 ohm load required by the computer output; the rest is provided by the series combination of VR1 and R4 in parallel with it (1270//82 = 77Ω). R2 in the emitter of Q1 also provides base bias for Q2, an NPN emitter follower which has R3 (10k) and the 75 ohm load of the Red input of the monitor (CN2 pin 1) as its emitter load.

With no input signal, the base of Q1 will be connected to ground (0V); so Q1's emitter will be at 0V plus the base-emitter junction potential, about +0.7V. The base of Q2 will be at the same potential, but because this is an NPN transistor it's emitter will be at 0.7V less than its base-emitter junction potential. There is a small bias current in Q2's emitter of about 1mA, so the emitter voltage will be about 75mV when a monitor is connected.

This arrangement gives good linearity, very wide bandwidth and terminates the computer's output as required, but yields a very slight negative gain which is of no significance in use as it is easily restored by the contrast control (actually video gain) of the monitor. The Green and Blue buffers are identical to the Red one.

Normally, a video amplifier which is expected to drive a 75Ω input will have a gain of two, to make up for the 6dB loss due to the usual 75Ω resistor in series with its output. This technique is known as *back termination*, and ensures

that when a cable exhibiting a characteristic impedance of 75Ω is connected and terminated at its far end into 75Ω, the signal will be reduced by half (ignoring other cable losses) and will be free of impedance-sensitive anomalies such as reflections and smearing, which spoil the picture. It will be 'matched' to the cable because both ends see a purely resistive load of 75 ohms.

The transistor buffer circuits in the VGS2 are only intended to drive a short monitor cable (less than five metres) and will perform excellently if that cable is the proper 75 ohm stuff! (Data cable is no good for wide-bandwidth graphics — don't use it if picture quality is important, certainly not at resolutions of over 800 x 600, and absolutely not for cables longer than two metres.) In any case, the RGB buffers isolate the rest of the circuitry from anything the monitor may do to its input signals, and always terminate the computer's RGB correctly whether there's a monitor connected or not.

These two features make the VGS2 very consistent and easy to use, especially for people who don't want to have to bother about the technicalities of termination. Now, on to the rest of the circuit.

IC1 is a special triple op-amp designed for RGB video, a type EL4393C made by Elantec. You may not be familiar with the circuit symbol, which indicates that this is a current-feedback amplifier unlike the more usual voltage-feedback amplifier.

These amplifiers have some unusual and very attractive characteristics for use with high frequencies, such as:

- The bandwidth is essentially independent of the gain for values between 1 and 10;
- The useable bandwidth is in excess of 100MHz, for low-level signals;
- The distortion decreases with increasing output level;
- The slew rate increases with increasing output level; and
- The outputs can drive 150 ohms directly.

There isn't the space here to discuss these amplifiers in detail, so the reader is referred to further reading. (See ref's 1, 2, 3 and 4 at the end of this article.) Suffice it to say that the feedback resistor, in this case 1.5k, needs to be kept low in value and that the current taken by the inverting input affects the gain slightly. To all intents and purposes though, the usual (Rf+Rg)/Rg gain formula is accurate enough and in our case configures the amplifier for a voltage gain of approximately four, or +12dB.

The EL4393C also has some special requirements, as you may expect. For example, stray capacitance between its pins must be minimised and the connections to the inverting and non-inverting inputs should be as short as possible. This has been achieved in this design by using surface-mount types for the 1.5k feedback resistors and mounting them directly under the IC on the solder-side of the PCB, also the use of a ground plane on the top side of the printed circuit board and of course, careful layout and power supply bypassing. The result is that the finished unit has the widest possible bandwidth and is unconditionally stable.

Note that the EL4393C should *not* be mounted in an IC socket — this will add too much additional capacitance!

All in all, the EL4393C is very well behaved and requires little or no taming, as may be observed by the complete lack of capacitors across the feedback resistors or any other frequency-conscious networks.

The Red input to IC1A pin 2 is via VR1, which also has a 270Ω resistor to 0V, to extend the useful adjustment range. VR1 (along with VR2 and VR3) is adjusted to give unity gain when the output signal is measured at the end of the connected cable, or just to give a normal output. There is enough gain (+6dB in reserve) to compensate for more than 60 metres of our HQ monitor cable. That's a long cable by any measure, but the pictures look just as good as they do over a short one. Remember, you can't use data cable.

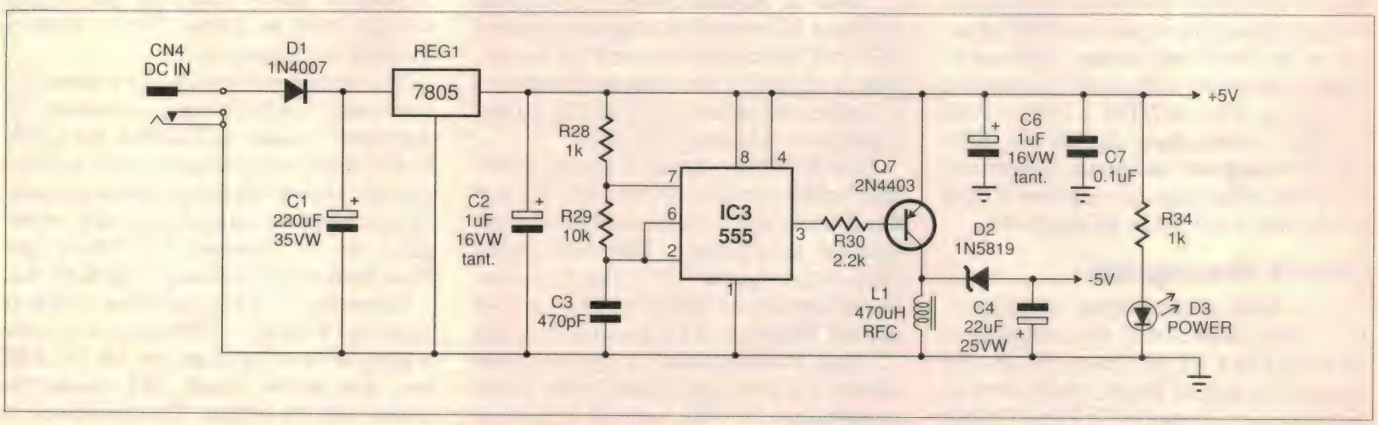
The gain controls can also be used to alter the colour balance if required, or to compensate for a graphics card with imperfect colour balance. The output of IC1A is connected to the Output connector CN3 pin 1 via 75Ω resistor R31 to provide true 75Ω back-termination. The Green and Blue amplifiers are identical to the Red, so require no further explanation.

There is one more very interesting feature of the EL4393C — the disable pins, or more correctly, the enable-bar pins. The outputs of the EL4393C can be tri-stated, that is, disconnected when the associated enable-bar pin is taken to logic high or +5V.

In the VGS2, this feature is used to blank the RGB outputs when the junction of R31 and C11 is allowed to rise to +5V, by breaking the normally closed contact of CN5. This can be achieved by merely plugging a mono or stereo 3.5mm plug into it, or a length of cable can be connected to a switch for remote control. Only the RGB signals are disconnected, leaving the sync signals running as normal.

The advantage of doing this is that the data projector or monitor will remain on and 'sunk up', for instantaneous stable display when the RGB is re-connected.

All VGA and multisync monitors made since 1992 will turn completely



Here is the power supply circuitry. IC3 is used to generate a -5V supply for video amp IC1.

off if the H & V sync's are removed; this is their 'power-saving' feature. Some data projectors forget what mode they are running at if the sync signals are removed, and take quite a few seconds to re-sync when the signals are re-applied. So the VGS2 neatly avoids these inconveniences and makes for very professional presentations.

The sync is neatly handled by a single 74HC14 hex Schmitt inverter. The horizontal sync from pin 13 of CN1 is connected to pin 9 of IC2 through 1k resistor R20, and vertical sync through R24 to pin 5. Electrostatic discharge (ESD) and 'leaky' double-insulated equipment are prime sources of voltages destructive to CMOS chips, so these 1k resistors provide some protection courtesy of the input clamping diodes in the chip by limiting any current that may flow into the pin.

A value of 1k is a compromise, though. 1M would be better, but the delay caused by stray capacitance would delay the sync so much that the picture would be shifted way off to the right. Even 1k causes a tiny shift, but this is easily corrected by the picture shifting controls on the display device.

Note that on the schematic, pins 13 and 14 of CN1 are shown connected to +5V by 2.2k resistors (R19, R23). Doing this ensures that the TTL inputs will swing almost up to +5V, to make sure that the CMOS switching threshold is exceeded. We've found in practice that the resistors are not really needed for this purpose, and they have not been provided for on the VGS2's PC board. However they do provide extra protection against transient damage, and for this reason we recommend that the resistors are added manually under the PCB. They're supplied in the kit.

IC2d's output connects to two more inverters, IC2e and IC2f, which return the horizontal sync back to normal polarity. Their outputs are passed through 75Ω resistors to limit short-circuit current to a safe value (since 74HC chips can deliver quite a high current), provide some ESD protection and pseudo-matching for the occasional data projector which expects analog sync (0.3V peak) rather than TTL, and which may be fed through a 75Ω cable to a 75Ω terminated input. We've got all the bases covered!

IC2c connects to IC2a and IC2b and is used in an identical manner for the vertical sync.

You've no doubt noticed that pins 4, 11, 12 and 15 are connected directly from CN1 to CN2; why is this so? Some laptops, (including Macs, which now have a VGA output — yes VGA!) and other computers with XGA outputs or other 'intelligent' graphics cards, sense these pins at boot-up time to determine whether a monitor is connected and what type of monitor it is. They then provide an output according to the combination of pins connected to 0V (usually, but not always). Therefore we have provided for the connected monitor to be able to communicate this coding information to the computer.

The front of the splitter box has only a power indicator LED and a 3.5mm jack which can be used with a remote switch, to blank/unblank the remote display without losing sync.

For anyone who has ever tried to connect a Mac to a splitter, this will be a Godsend; but note that adaptors will be required to interface to a Mac the high density 15-pin 'D' type connectors we have used in the VGS2. Let us know if you want these things.

Last, but not least, there's the power supply. The whole unit uses less than 100mA. Raw power from a nominal 12V DC plug-pack or 12V battery is connected through D1, a general purpose 1A diode to C1, 220uF/35V and REG1 a 7805 positive 5V regulator. D1 is there for reverse polarity protection, but will function adequately as a rectifier if an AC supply is connected. C1 is rated at 35V which just happens to be the maximum input voltage for a 7805. So you could use just about any supply you can lay your hands on, so long as it's 12V or over. But note that with 35V DC input, REG1 will be dissipating 3W and may shut down (or melt); so my advice is don't do it. Anyway, it's nice to know there's some safety margin, yes?

REG1 is mounted onto a Redpoint TV5 heatsink and will be barely warm with 15V DC input, which is what you will have from a common 12V/300mA unregulated DC plug-pack. The output pin of REG1 is bypassed to its ground pin with C2, a 1uF/16V TAG tantalum capacitor.

There are several 0.1uF/50V monolithic block ceramic (MBC) capacitors sprinkled about the +5V rail, to keep transients and other disruptive influences minimised. A 5mm high-efficiency red LED, D3, passing about 3mA, tells you that the +5V supply is present when it is illuminated.

IC3 oscillates at approximately 140kHz and drives the base of Q7, a 2N4403 switching transistor. This in turn connects and disconnects L1, a tiny 470uH radio frequency choke (RFC) to the +5V rail. IC3 is bypassed very solidly with another 1uF TAG and a 0.1uF MBC to keep its spikey stuff confined. L1 produces a flyback pulse when Q7 turns off and this is rectified by D2, a Shottky rectifier which is fast and has a low forward voltage drop. C4, 22uF/25V, charges to -5V or so and this is connected to the negative supply pin of IC1, which is the only thing that uses it.

The negative voltage generator consumes about 50mA to supply about 25mA, which is only 50% efficient, but it is cheap and reliable. Note that the -5V rail is not regulated and is load-dependent, but can be anywhere between -4V and -8V without any offsets or other strange effects occurring at the outputs of IC1.

I could have designed the power supply to use an AC plug-pack, but I like the idea of being able to run the VGS2 off a 12V battery supply, and intend to try and make all my designs do this.

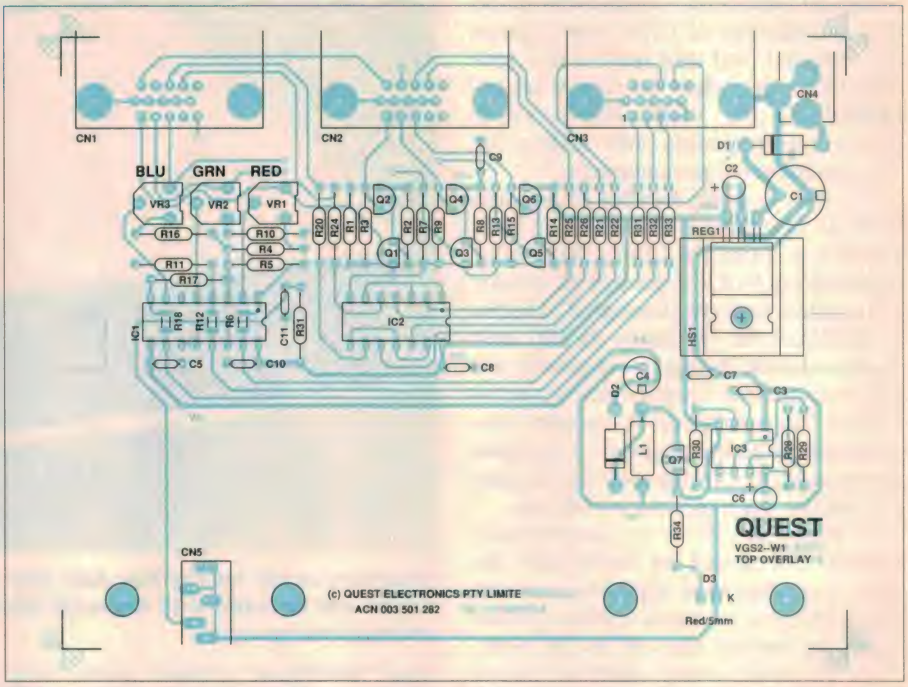
Construction

Solder the three surface-mount resistors under IC1 on the underside of the PCB first. Our PCB has a solder coating, so all that is required is to place them one at a time, as straight as possible; hold down with a pair of tweezers or a jeweller's screwdriver and then heat one end and the PCB pad until the solder melts. This will hold the part in place while you solder the other end, applying a tiny amount of fresh solder. Then re-solder the first end with a bit of fresh solder and the part is in place.

We supply all the axial resistors precut and bent, so insert a few at a time, referring to the overlay diagram or the silk-screened pattern on the top side of the PCB. Place a small piece of foam or cloth to hold them down, flip the board and solder them quickly. There is no need to trim the leads.

Work through all the components except the ICs in this manner, starting with the ones that stick up the least so that they will stay in place while the PCB is upside down. Ensure that all polarised components such as electrolytic capacitors, diodes and transistors are inserted the right way round and in the right places. The transistors should be inserted so that they stand about 4-5mm clear of the PCB.

When you get to it, bend the legs of the 7805 down gently at 90° where they narrow, or approximately 3.5mm away from the body. This should allow the hole in the tab to line up with the hole in the PCB. Place the heatsink on the PCB, put the M3 x 10 screw through from the underside and hold in place with your finger. Put the grey silpad over the screw and then the 7805. Thread the M3 nut down just enough to hold this little stack in place, and straighten everything up before tightening the screw with a posidriv screw driver. No need to over-tighten. Now solder the 7805 and trim its legs.



This overlay diagram can be used as a guide, along with the photo below, when you're wiring up the project.

If you haven't done so, solder the DC socket onto the PCB, making sure it is down flat.

Before installing the three DB-15HD sockets, slightly 'cross the legs' of their PCB clips to allow them to pass more easily through the PCB. Only solder a couple of pins and then make sure that the socket is down flush on the PCB before soldering the rest. If it's not down flat, turn the PCB over whilst applying pressure to the one you're fixing and re-melt the two pins in turn. A little 'click' will signal that it is right down, so check again and don't solder the rest of the pins until it is right — they must align properly with the rear panel. Don't put too much solder down the clip holes, just a little dab at each leg of the clips will do.

Install the 3.5mm stereo socket; solder the middle pin and then make absolutely sure it is down flat before soldering all the pins. The LED is most easily installed with its leads left long. Make sure the short lead (or the lead closest to the flat spot on the lens) goes to the pad marked 'K' (for cathode). Put the LED's leads through the PCB so that the short one penetrates a couple of millimetres, then just push the LED back gently towards the 7805; turn the PCB over, solder it and trim the longer lead.

PARTS LIST

Resistors

R1,7,13	82 ohms
R2,5,8,11,14,17	510 ohms
R3,9,15,29,31	10k
R4,10,16	270 ohms
R6,12,18	1.5k SMD
R19,23,30	2.2k
R20,24,28,34	1k
R21,22,25,26,31, 32,33	75 ohms
VR1,2,3	1k horiz. trimpot

Capacitors

C1	220uF 35VW RB electro
C2,6	1uF 16VW TAG tantalum
C3	470pF 100VW ceramic
C4	22uF 25VW RB electro
C5,7,8,9,10,11	0.1uF 50V monolithic

Semiconductors

D1	1N4007 silicon
D2	1N5819 Schottky diode
D3	Red LED
IC1	EL4393CN wideband video amp
IC2	74HC14 hex Schmitt inverter
IC3	555 timer
Q1,3,5	BC559B PNP transistor
Q2,4,6	BC549B NPN transistor
Q7	2N4403 PNP switching
REG1	7805 +5V regulator

Connectors

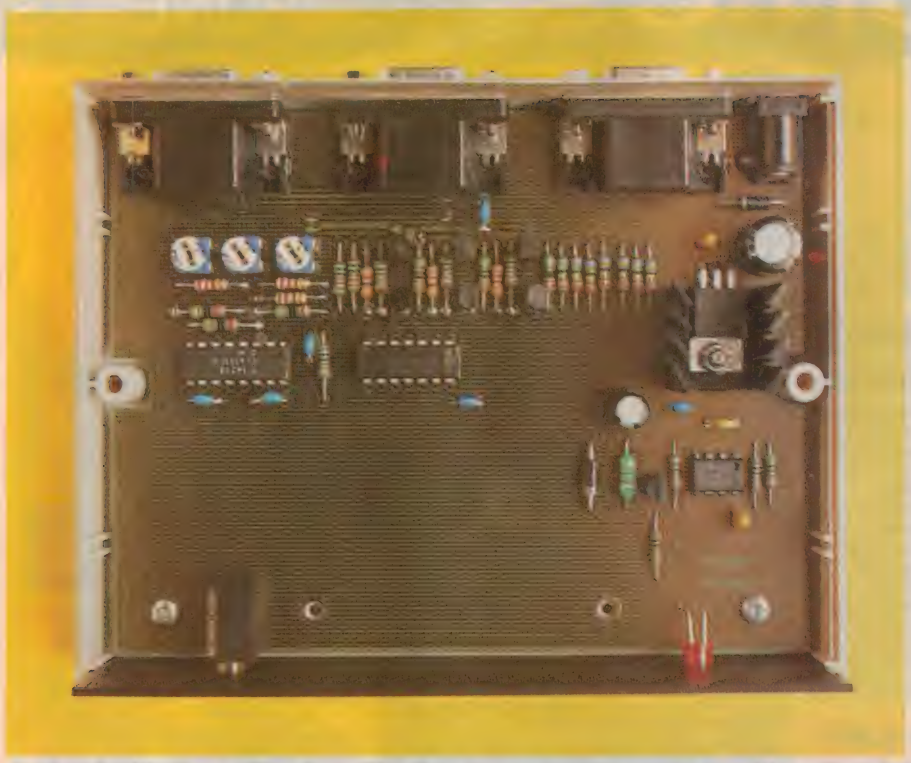
CN1,2,3	DB-15HDSRA
CN4	DJ25RA power connector
CN5	3.5mm stereo jack

Miscellaneous

L1	470uH RF choke
HS1	TV5 heatsink

ABS box, H0402; PCB, 129 x 111mm, code 'VGS2—W1'; two #4 x 9.5 self-tapping screws; 1 x M3 x 10mm raised head screw; M3 nut, steel, zinc plated; front panel VGS2FPW1, punched and printed; rear panel VGS2RPW1, punched and printed.

NOTE: Complete kits of parts for the VGS2 Computer Graphics Splitter are available from Questronics, of 2/1 Leonard Street, Hornsby NSW 2077; phone (02) 9477 3596. The price for the kit (not including plug pack power supply) is $79.00 plus $8 for packing and postage within Australia. For those who do not have the experience or time to assemble a kit, fully assembled and tested units are available for an additional $30. An approved 12V/200mA DC plug pack supply is also available for $9.95.



A view inside the splitter box. The three preset pots can be used to adjust for attenuation in the remote display cable, and also to adjust colour balance.

Leave the LED like this, but not shorting out to anything else, until the unit is finally assembled into the case — when it will be an easy matter to bend it forward in an artistic curve to poke through the front panel.

Now is a good time to check your work. Look for solder bridges between pads and make absolutely sure that all polarised components are the right way round. When satisfied, connect a 12V DC plug pack or 12V battery and check that the LED lights. The 7805 should remain cold at this time and nothing should be smoking(!).

The exposed thread of the M3 screw holding down the 7805 is a good place to clip the negative (black) lead of your multimeter while you check that +5V supply is present and within +/-100mV. If all is well, great! If not, check your work and find the cause.

Remember, don't panic; work slowly and calmly in a logical fashion. Measure the raw DC coming in; is the 7805 getting hot? If it is, there is a short on the +5V rail, perhaps one or both of the 1uF TAG capacitors is reversed. TAG caps are usually destroyed by reverse polarity voltage and should be replaced. Is the 220uF cap getting hot? Yes? It's almost certainly in backwards, so replace it. These are the most common types of faults.

Once the above test has been passed, unplug the supply and make sure that all traces of voltage are gone before proceeding.

Remove the IC's one at a time from their protective packaging and install in the PCB, making sure that they are facing the right way round and that all the pins have gone through the PCB before soldering. An IC inserter is a good idea as it will keep the pins straight and allow them to spring out slightly, holding the chip onto the PCB.

The 74HC14 is CMOS, so don't zap it! It is good practice to solder the power pins of all IC's first, so that their protective diodes are connected to the circuit.

Now power the board again and check pin 9 of IC1 for -5V (-4V to -8V is OK). IC1 and IC3 may get slightly warm; this is normal. IC2 should be cold. Check pins 1, 2 and 3 of CN2; they should all have less than +100mV on them. Check pins 1, 2 and 3 of CN3, they should have less than +/-100mV on them. Pins 13 and 14 of CN1, 2 and 3 should all have close to +5V on them.

If all these things check out, the PCB is ready to be installed in the case. If not, refer to the diagram and check your work. If the negative generator is not working, check for shorts, wrong polarities, etc. Have you swapped the 1N5819 and the 1N4007? The 1N4007 will not work satisfactorily as the flyback rectifier.

Final assembly

The case is made up of two halves, with the bottom having two countersunk holes in it. Decide which end you want to have as the rear — both halves are symmetrical except for a locating flange along one side.

Protect your eyes by wearing a pair of safety goggles, and with a sharp pair of miniature side cutters, cut off the four moulded posts. They don't have to be removed flush, it doesn't matter if they stick up a millimetre, we just need to clear the bottom side of the PCB. Don't remove the other four posts at the front, you need them!

Remove the six hex posts from CN1, 2 and 3. Place the rear panel over these connectors and loosely attach it with the six hexposts. Pick up the assembly, place the front panel over CN4 and then slide the whole lot into the bottom part of the case. With the two #4 x 9.5mm self-tapping screws, fix the PCB into the case using any two of the plastic posts at the front. The other two are left spare in case you strip the plastic out of the first two — don't over-tighten these screws.

Bend the LED forward as described previously, to poke through the front panel. Align the top part of the case to mate correctly and slide it down. Insert the two long screws and tighten gently; don't strip the posts in the top part of the case. Gently tighten the six hex posts — they are brass and will snap if over-tightened. Voila! it is finished.

Cables

It can not be over-stated that the cabling will have a major influence over the quality of the distributed video graphics signals. Don't use data cable if you want good pictures. This unit will work best with high-quality monitor cable designed for the purpose. This cable has three miniature low-loss 75Ω co-axes for the R, G and B signals and two other pairs for the sync signals, all wrapped up in an aluminised foil, a copper braided screen and finally a 7mm OD black vinyl sheath. Refer to Questronix' half-page ad in this issue for HQ cable and 'D' connectors suitable for making cables to use with the VGS2.

Further reading

Here are the references noted earlier in the text:

1. Tutorial #2, High frequency amplifier instability: Elantec1994 Data Book
2. Application Note #3, DC Restored current feedback video amplifier: Elantec 1995 New Products Data Book
3. Application note #23, Practical current feedback amplifier design considerations: Elantec 1997 Data Book
4. EL4393C data: Elantec 1997 Data Book. ❖

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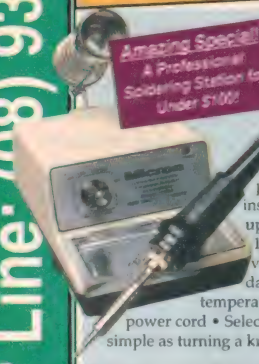

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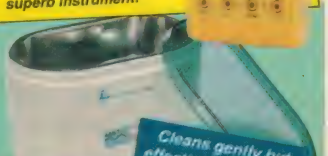

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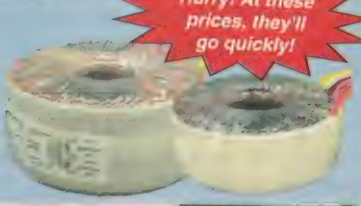

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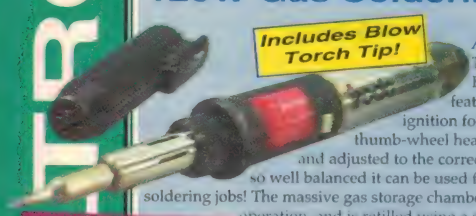

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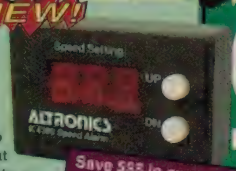

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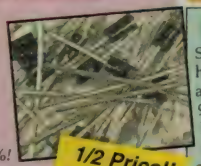

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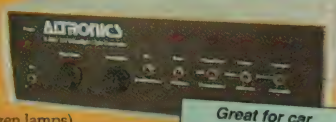

Based on the original Silicon chip Discolight, this unit offers the same features as the mains version only with low voltage rails , making it ideal as a school project or to add something different to your car at the next car show or auto salon! Supplied with an attractive case with pre-punched and screened front panel and parts to build and power the unit off 12V DC *(halogen lamps not supplied).* **Features:** • 4 channels (20W or 50W halogen lamps) • Forward, reverse and auto reversing chaser patterns with music modulation • Simultaneous strobe on all channels • Alternating light patterns • 12V DC or AC operation • Direct input from loudspeakers or aux level or mic pickup.

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Vintage Radio

by ROGER JOHNSON

Two postwar Kriesler mantel sets

A very popular radio with Australian households after the war was the Kriesler 'Beehive' model, first produced in 1946, which has become a collector's classic. The second set we discuss this month is the 11-29, a later model in the Kriesler mantel range which was also quite popular.

The Kriesler model 11-4 — or 'Beehive' as it has become colloquially known — is a very popular radio with collectors and rates with the Astor 'Mickey', AWA 'Radiolette' and HMV 'Little Nipper' as a true classic. Like the latter models it's found in many collections.

First released in 1946, the circuit is a dual wave reflex 3/4 valve superhet in which there were an incredible number of variations. The cabinet fully encloses the chassis, a feature which Kriesler extolled in their advertisements. The cabinet consists of a base portion screwed to protruding pillars from beneath the chassis, and the upper portion which comprises four 'hoops' and the top. These five pieces are held together with four long screw-threads, which protrude through the chassis and are secured with nuts. The hoops are louvres to allow for the egress of sound and for ventilation.

The colours were a factory painted cream on brown bakelite, brown bakelite, or a two tone affair. It seems there was also a factory painted cabbage-leaf green, although I have yet to confirm this.

The photo in Fig.1 shows a factory painted cream, which has been subsequently been given the 'once-over' with the inevitable coat of Dulux Super Enamel — which in this instance looks as though it was applied with a clothes brush. The colour is, of course, the very fashionable 'off white'!

Fig.1: The Kriesler 'Beehive', in factory cream as repainted with household paint.

The circuit

The circuit (Fig.2) holds no great surprises. The shortwave aerial primary is in series with the broadcast primary, affording a cost saving — as too are the exciter sections, i.e., secondaries, of the oscillator coils. When switched to short waves, that portion of S28 is closed, resulting in an earthing bar shorting out the broadcast oscillator tuning coil as well as the broadcast aerial coil primary.

The inset modification uses a four-position switch in which all coils are switched in the more conventional manner. Note also that in the modified front end, the oscillator anode isolating capacitor is in the earth end of the coil, and not the anode or 'hot' end.

Note that the reflexing is used around the 6G8-G IF amplifier stage, so that it also acts as the first audio amplifier. One of the valve's two diodes acts as the main detector, and the other as the AGC detector.

The screens of the 6J8-G and the 6G8-G are fed from a common resistor and bypassed via the same capacitor. Delayed AGC is applied to both the reflex stage and the mixer stage in what was slightly unusual practice. Back bias to all stages is obtained from the divider network R138 and R139, and the 6V6-GT is over biased to limit power output and total current consumption. There is no attempt at audio feedback (thank heavens).

The variations

Listed in the Australian Official Radio Service Manual for 1947 are no less than 33 variations. It seems quite incredible that there could be so many

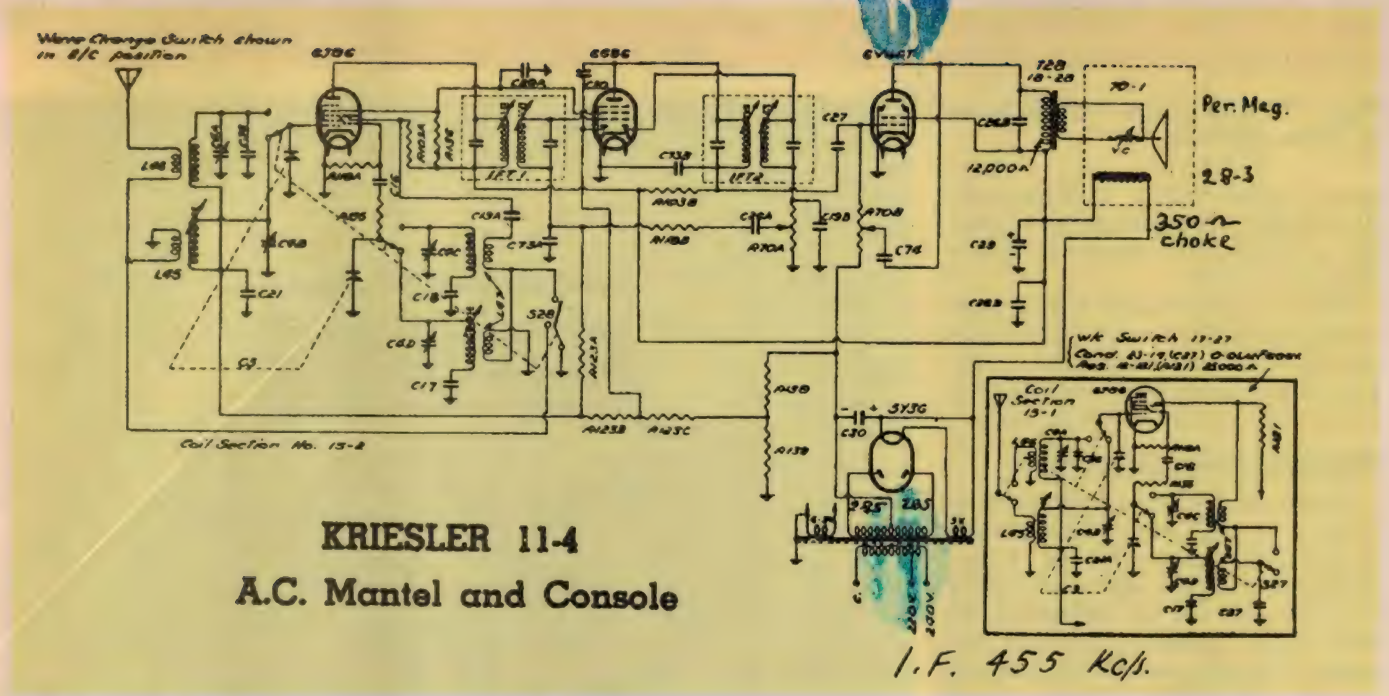


Fig.2: The circuit of the 11-4, which dates from 1946.

modifications within one year of the prototype. The service manuals were published the year following the given year of production, so it is not as though the service manual accounted for a 10-year gap or anything like that. That many variations works out to about one every 11 days. The poor Kriesler production engineer!

Admittedly some of the variations are very minor, such as the substitution of one coil kit for another (which is was not all that uncommon for certain other manufacturers of the day) and a different value of the top-cut tone capacitor. Other variants were not so minor, such model 11-4FZ which lists:
(a) Tone control potentiometer (0.5 megohm) replaced by a two-position switch, 0.02uF 600V condenser (C95) and 0.5 megohm 1/2 watt resistor (R117). Disconnect lead from centre lug of the potentiometer and wire it to stationary contact of switch. Earth moving arm of switch. Replace potentiometer with fixed resistor.
(b) Power transformer changed from 18-27 to 18-32.
(c) 6J8-G converter replaced by ECH35G
(d) Resistor R103A (15k) replaced by R135A (40k); R136 (30k) replaced by R153B (40k)
(e) R139 (50 ohms) replaced by R157 20 ohms
(f) 5Y3-G valve replaced by 6X5-GT rectifier, which is connected to the 6.3 volt winding on power transformer
(g) HT choke to replace field of 70-1 speaker.

It was also stated that the circuit in the bottom corner of the circuit diagram applies. The unusual numbers refer to Kriesler part numbers.

Basically, the major alterations consisted of a field coil electrodynamic speaker, a filter choke, a high wattage filter resistor used in conjunction with or instead of the filter choke, a 6X5-GT rectifier and an ECH 35 converter. A given variant could incorporate some or all or a combination of those alterations, as was seen by the above example. Above and below chassis photographs are shown in Figs.3 and 4.

Note that the 5Y3-G rectifier is used and not the smaller 5Y3-GT. Some of the earlier sets may also have used the larger 6V6-G.

Virtually the same circuit was used in an all-bakelite table model radiogram a couple of years later, in which the pick-up was fed directly into the grid of the 6V6-GT.

The 11-4 is described as both a mantel and console model, but judging by the vast number of mantels that have survived to this day, the mantels must have quite considerably outsold the consoles.

Problems & repairs

The top of the bakelite cabinet is prone to a small heat crack in the bottom corners of the dial aperture. Sometimes, the crack will extend right through to the outer edge. The name badge is fragile and prone to breaking.

Any major damage to the cabinet is virtually unable to be repaired, and the set can only be regarded as a salvage proposition. However, that is not as bad as it sounds, because one may be able to obtain a 5" electromagnetic speaker for such projects as a 'Little General', or a replacement speaker for the model 28 'Radiolettes'.

As far as the chassis is concerned, the major items to cause concern are the power transformer, choke, electromagnetic speaker (if fitted) and valves. The coil kit and IF transformers are pretty reliable. Then of course there is always the possibility of a dud valve. It is

Fig.5: The later model 11-29, in factory cream bakelite.

always good practice to replace the electrolytics and audio coupling capacitor no matter how original one wishes to keep one's set.

The best source of major items is a salvaged chassis. The beauty of these sets is that because of the vast number of official variations, two quite dissimilar versions can be combined with impunity!

Performance, alignment

There are no tricks to alignment. Unless an IFT has actually been replaced, or shows evidence of tampering, it is a good idea to give them a tweak after the RF alignment. As both of the broadcast coils are slug tuned, it is quite possible to tune the set down to 531kHz if there is local station on that frequency in a given locale. The top end will require careful adjustment, but once completed the dial calibrations have minimal deviation. Shortwave alignment consists of picking a strong station at the very top of the band and peaking the aerial trimmer. There is no oscillator trimmer to worry about.

If you are attempting to tune down to 531kHz, it may be necessary to align the top and bottom of the band two or three times to obtain maximum performance, as well as a slight adjustment of the dial pointer before the alignment is finally completed. Once thus finished, peak the IFT's — which should only be marginally in error.

One aligned, these little sets perform very well indeed. With 10 or so feet of antenna wire trailing behind it, the shortwave section performs particularly well. As well as their attractive cabinet, the overall performance makes these little sets very collectable.

Fig.3: This particular chassis variant has an electromagnetic speaker and a replacement output transformer.

The model 11-29

This receiver was chosen for no other reason than it was featured on the dust cover of Ingliss' definitive history *This is the ABC* (K.S. Ingliss, Ingliss 1983). A sample is shown in Fig.5.

The 11-29 is described as a 1952 model, just ripe for tuning in to 'Blue Hills' and 'Portia Faces Life'. It was available in either brown or cream bakelite, and the brown bakelite models look particularly attractive with white knobs.

This model, for broadcast band only, can be considered as a logical successor to the 11-4. It uses the newest of the innoval nine-pin valves, types 6AN7, 6AD8, 6M5 and 6V4 (or EZ84). There was another version in the same year using types 6SA7 and 6N8 in the front end, followed by the other two valves, and there the variants seem to cease! Despite having the same model designation, there are differences in the circuit. Indeed, with different valve types it makes one wonder if a different model designation would have been justified.

In both instances the circuits are a 3/4 valve reflex superhets with simple AGC applied to both the mixer and IF stages, and both incorporate a degree of audio feedback in one form or another.

As with its predecessor, the chasses are quite rigid and are made with a good quality plated steel. Like the

Beehive the cabinet fully encloses the works, and has speaker slots both front and rear with grille cloth in both places. One advantage of enclosing chassis in this manner, and also with the 11-4, is that it dustproofs them rather well. Once the cabinet has been removed it is a joy indeed to work on a chassis without having to remove a thick layer of dust and grime.

Unfortunately, the cream cabinets suffer the curse of much cream bakelite in that they are prone to very fine heat cracks in the most visible places. These cracks disappoint many enthusiasts because they are so fine and are not damaging to the cabinet, but become imbued with grime — thus highlighting their ugliness. The most annoying aspect of them is that there is very little one can do to repair them without making them look worse.

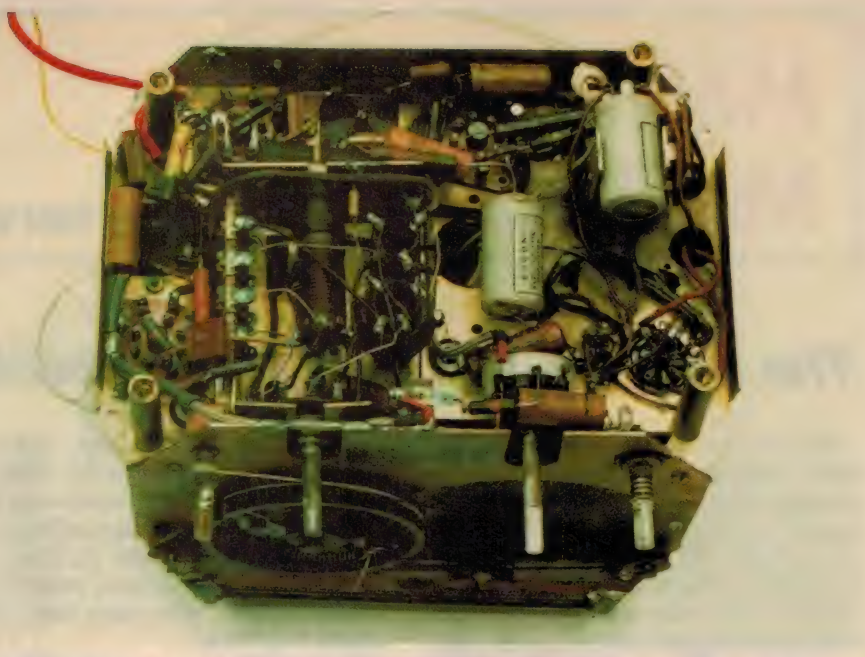


Fig.4: Under the 11-4 chassis. Apart from the replacement of electrolytics, this sample is very original.

Repairs & alignment

There is no suggestion of an electromagnetic speaker in these models. HT filtering is achieved with a 3W/1500Ω resistor. Unless this item is wirewound, it is prone to burning out, and a wirewound type should be considered if a replacement is necessary. The other resistor which carries the total HT current is the back bias resistor, which is also prone to burning out; so again a wirewound type should be considered for replacement purposes.

With ferrite slugs again fitted it is possible to tune down to 531kHz and with careful alignment, dial mis-calibrations should be minimal, if not un-noticeable.

In closing, both these little sets are well made and are good performers, with the 'nod' going to the 11-4 for its stylistic cabinet and dualwave facility. ❖

Moffat's Madhouse...

by TOM MOFFAT

The incredible 56k modem debacle!

This is a tale about modems, and the havoc they can wreak when new technology is released on the market before it is ready. Here in the USA, the promotion of the latest 56k modems has brought about things which, if done in Australia, would surely cause the Trade Practices Commission to have kittens. Some brand new 56k modems *simply don't work*! Many never will work. But before going into these 'interesting' business practices, it's time for some tekkie stuff.

The new 56k modems are supposed to allow Internet users and other online people to communicate with their various services at 56,000 bits per second (b/s), almost twice the previous speed standard. This is supposed to take place along telephone lines that were designed to transmit data at 2400b/s and no faster.

As higher and higher online speeds developed, the actual bit speed along the circuit didn't really increase. More effective speed was provided by varying the *phase* of the bits, as well as turning them on and off. The phase of a signal could be assigned to one of several available *states*. Two states for each bit would allow the data speed to be doubled to 4800b/s. Four states give 9600b/s, eight states give 19,200b/s and so on.

Following this line of reasoning, more modem speeds such as 28,800b/s would require 12 states, and 33,600b/s would need 14 states. But beyond 33,600, this system falls apart. If you divide 56,000 by 2400, you get 23.75, not an integral number of states. But, if you REDUCE the basic bit rate to 2000b/s instead of 2400, everything falls into place. Specified connect speeds for 56k modems start at 32,000 and go in 2000 steps to 56,000. So, if these things work like traditional modems, the 56,000 speed would require 28 states of the 2000b/s signal.

This is, I must admit, pure conjecture on my part. I have yet to see anything that resembles a decent technical discussion on the 56k standard, probably because there is no such thing as a 56k standard. There are two competing 56k 'methods' at the moment, X2 and k56flex, being promoted by different modem manufacturers. Both would like you to believe their product will become the standard, but in reality it's likely the eventual standard will be an amalgam of X2 and k56flex, with some other stuff thrown in as well.

At this stage I am most familiar with k56flex, having played around with several modems of that type (more on this later). And it certainly seems likely that they have reduced the transmission rate to 2000 so they can introduce more states, and hopefully make the damn thing work at 56,000b/s. But, in the USA at least, it doesn't. It can't.

There is a technical restriction on US phone lines — bandwidth, transmit power, noise — that prevents them EVER allowing data speeds of faster than 53k. Which, in k56flex means 52000, the next lower standard speed. So a 56k modem ain't. It's a 52k modem. Under perfect conditions.

In the real world, most 56k modems never get above 50k, and a more likely speed is 44k, or 40k. This is because phone lines are far from perfect, and the modulation technique is so fragile that the slightest degradation can knock it silly. And something else that's seldom advertised is that these '56k' speeds are only possible in the download direction, from your Internet Service Provider (ISP) toward you. Going the other way, the limit is 33.6, exactly like the older modem you just threw away in favour of a 56k model. To understand why, we must now introduce the concept of 'digital modems'.

Yes, you've probably heard the term '56k digital modem'. This is indeed true on the Internet Service Provider end, but the modem sitting in your computer is a good ol' analog device, as is the phone line to the telephone exchange.

Modern telephone systems use digital means to provide trunk circuits between the various local telephone exchanges. This means that the central offices are full of analog to digital and digital to analog converters, to make the transition between the analog subscriber lines and the digital trunk circuits.

In the case of an ISP's 56k digital modems, analog lines only travel between the computer user and the telephone exchange. There they hit the A/D and D/A converters, where signals are converted to digital, multiplexed onto a high-speed data line, and shot off to the ISP.

The ISP has a digital contraption that connects to the phone company's data line on one end, and to a local Ethernet on the other. The Ethernet soon reaches a router, which accesses another high-speed line and puts the computer user onto the Internet. A piece of cake, compared to the nasty old banks of analog modems that had to be pampered on a daily basis. No wonder the ISPs love digital modems so much. When they work, that is.

The reason the 56k digital scheme only works in one direction is because a digital-to-analog conversion takes place going toward the computer user, but coming back the other way, the conversion is analog-to-digital. D/A conversion in its simplest form can be done with a simple passive resistor network, but A/D conversion requires much more fiddling, and the results are always approximations. With the current state of the art, it is simply impossible to force 56k speeds through an analog-to-digital conversion. The practical limit seems to be 33.6b/s.

Here in Port Townsend Washington, the local ISP (whom you read about in December *EA*) has a lovely digital modem setup. He wanted to get his subscribers up and running on 56k, so he phoned his contacts at the phone company. They said, "sure, we can handle 56k. You just buy your modems and we'll do the rest". But guess what: nobody in Port Townsend has ever succeeded in connecting at any speed over 33,600b/s through the digital modems. As this is being written, nobody knows why. This has gone on for several weeks. The phone company is investigating.

Modems that can't

But maybe this isn't such a big deal, because a goodly number of computer users' new 56k modems won't work either. And this situation is verging on a national scandal. I have been right in the middle of this whole mess, hired by the ISP as a consultant to try to figure out why nobody can connect at 56k speeds.

The ISP took the plunge and chose the k56flex 'standard', primarily because the Livingston company, which he'd been very happy with in the past, had developed a k56flex Portmaster digital modem unit. As well there were many more k56flex user modems on the market than X2 models. So the ISP bought the Portmaster, along with several several k56flex modems from different manufacturers to get the feel of the system from the user's point of view. It was my job to test them until the whole thing came a cropper.

The ISP ordered the modems from the same sources the average user would use, the big mail-order discount houses. Their catalogs were full of 56k modems, and there were ads plastered all though the American computer magazines extolling the excellence of 56k. Trouble is, most of them didn't work. And what's more, some of the modems sold as brand new 56k units WOULD NEVER WORK, EVER.

This interesting situation was discovered only through bitter experience, because none of the suppliers was game to advertise the fact that they were selling stuff that was totally useless for the intended purpose. My own home soon resembled 'Modem City' because of the stacks of modem boxes on the floor, and the piles of modems on my desk.

I went through them one by one, hooking them up to my laptop computer serial port (all were external modems), doing the installation routines, and then placing calls to the ISP's digital dial-up number in Sequim, since the Port Townsend central office equipment was kaput. Every single one of them connected at 33.6k, and no more. We knew the ISP equipment in Sequim was OK, because users in Sequim (the lucky ones with modems that worked) were getting speeds above 40k. Other people tried trunk calls from half way across the country, and they worked as well.

Finally the truth began to come out. The Livingston Portmaster digital modem thingo would only connect at 56k speeds if the firmware in the user modem was Version 1.0 or later. Some modems being shipped by the suppliers had firmware version 0.519, although they were capable of letting the user upgrade the flash memory by downloading a file from the Internet.

So I spent many long hours, downloading new firmware files, and flashing modems. Normally this was quite easy — a file of 400k or so, and an MS-DOS loader program to wake up the modem and shove in the new firmware. But a couple of manufacturers decided they wouldn't lower themselves to DOS, so they released enormous Windows programs to do the same job. One of them I downloaded was over 2MB long. It installed itself into my Windows 95 permanently, although it was intended to be run only once, to flash one modem. There was no uninstall feature provided, so I spent a lot of time ripping out this Windows flash program chunk by chunk, file by file. Very nasty.

But there's more

But wait! There's more! Several modems were coming out with version 0.520 of the firmware, which had a little problem: *it could not be replaced by flashing the modem.* The only way to upgrade from 0.520 was to send the modem back to the factory to have the memory chip physically replaced, with shipping costs to be borne by the user.

Now maybe I'm a little old fashioned or something, but it does seem to me that if a supplier sells something billed as a 56k modem, it should work as a 56k modem without being forced to send it back to the factory for radical surgery.

There are people who agree with me, too. Here's a sample of that thinking, as picked up from a news group:

*I had a 0.520 model which couldn't even handle the 1.002 upgrade, so I had to get an RMA (return authorization) to get a new one. Guess what... they sent me the exact same modem I had. I can't believe what a *x!?@%! joke this whole 56k scam is...*

I ordered the replacement modem from a form that was specifically set up for modems that wouldn't take the firmware upgrade and they still sent me the wrong one. There should be a class action suit filed against all of these companies for knowingly screwing so many people...

I waited all this time for my ISP to get their equipment and now I can't even use it because Livingston racks require V1.0 or higher K56flex firmware. Why isn't there a discussion on this group about how every modem manufacturer today is knowingly selling non-functional beta products that simply do not work?

Moot point?

Perhaps the modem manufacturers, and the retailers, think this whole business is a moot point. When the 'official' 56k standard is implemented, and that could be up to two years away, it is very likely that new hardware techniques will be introduced. That possibly means NONE of the present crop of '56k' modems could be made to work as 56k, flash-upgradable or not.

So if the manufacturers and retailers suspect all 56k modems will have to be replaced in the end, perhaps they're just biding their time right now, hoping the official standard will come along before they have to upgrade existing modems to some interim standard.

Several manufacturers are giving guarantees that, should the new official standard force total replacement of existing modems, they will do so for free. Of course there is no mention of who gets to pay the shipping. And there is certainly no guarantee that all the current manufacturers will still exist in two years' time.

My recommendation to OlympusNet management has been to advise members to stay completely clear of so-called 56k modems until this whole mess is sorted out — that is, until there is a real 56k standard and modems can be demonstrated working to that standard. And that is the position OlympusNet has accepted.

The new digital modems are working just fine at speeds up to 33.6b/s, with far better performance than with the older analog units. So there's nothing lost. In theory, since the new Portmasters are almost all software and no hardware, they can also be upgraded to whatever eventuates as the final 56k standard.

Maybe you people in Oz and New Zealand will get off lighter than we have here. I've read some tests and reviews of modems that do actually WORK at speeds between 40 and 50k, and those made by Banksia got top marks. But if it were me, I'd still be pretty cautious about lashing out for a new 56k modem right now. All good things come to those who wait! ❖

EA'S READER SERVICE BBS

As part of our service to readers, *Electronics Australia* operates a Reader Information Service Bulletin Board System (BBS), which makes available a wide range of useful information for convenient access and rapid downloading. You can also leave contributions to some of our columns.

The BBS is ANSI compatible and is currently operational for virtually 24 hours a day, seven days a week, on (02) 9353 0627. Use any speed up to 28.8kb/s.

50 and 25 years ago...

'Electronics Australia' is one of the longest running technical publications in the world. We started as 'Wireless Weekly' in August 1922 and became 'Radio and Hobbies in Australia' in April 1939. The title was changed to 'Radio, Television and Hobbies' in February 1955 and finally, to 'Electronics Australia' in April 1965. Here we feature some items from past issues.

January 1948

EDSAC — The Electronic Brain: Thirty-three year old Cambridge professor Dr M.V. Wilkes, director of the Cambridge mathematical laboratory and ex-wartime radar backroom boy, is busy putting finishing touches to his electronic brain. The two-ton memory machine is the first in the world of its kind, and has been called EDSAC (for Electronic Delay Storage Automatic Calculator).

The brain will complete 100,000 different calculations per minute and remembers by storing constantly moving electric and supersonic waves in a circuit of metal tubes filled with mercury. Questions will be fed in on punched tape, and answers delivered on a teleprinter. There are 32 of the 4ft long mercury tubes, more than 1000 valves, and miles of wire in the machine.

Surgery Televised: Thousands of surgeons attending the Congress of the American College of Surgeons at the Waldorf-Astoria Hotel in New York have witnessed operations by television in viewing rooms a mile from the hospital. For the first time in the long history of medicine, the skills of the best known surgeons have been closely observed by members of 'clinics' remote from the hospital operating theatre.

January 1973

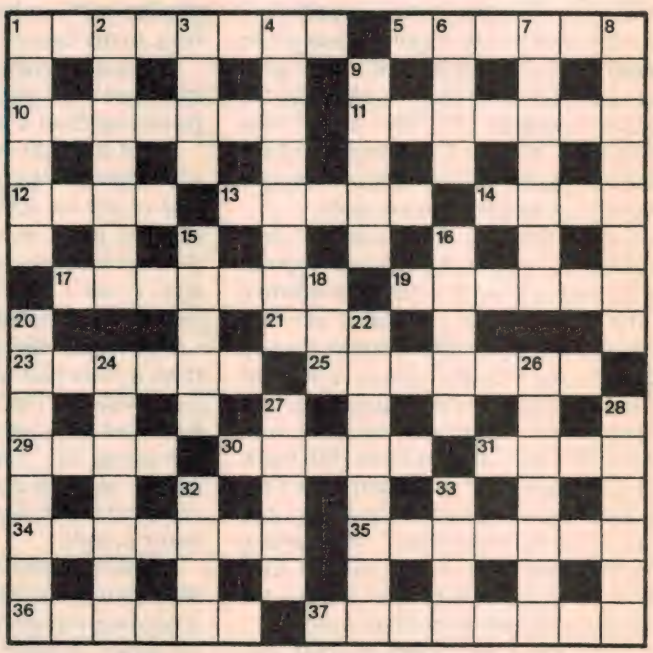
Canada claims a First in Satellite Communications: The world's first domestic communications system using synchronous-orbit satellites, Canada's Telesat, is scheduled to go into operation this month. The first of Telesat's stationary transponder satellites, named Anik-1 (Eskimo for brother) was launched by NASA in November. It was placed in orbit over the equator, synchronised to the Earth's rotation, directly south of New Mexico.

Within a few months a second satellite, Anik-2, is due to be placed in orbit nearby to use as a back-up. Anik-1's 10 channels are virtually sold out, with eight being already sold and two being initially kept in reserve in case of problems. The initial use contracts total more than $98 million for Telesat Canada, which is a corporation set up by the Canadian government to run the satellite communications system.

Compact VCR uses 1-inch Video Tape: International Video Corporation (IVC) in the US has released a line of video cartridge recorders, the VCR-100 series, which use cartridges of 1-inch tape on standard 8-inch reels. Each cartridge contains a full hour of video programming.

Intended primarily as a portable adjunct to professional recording equipment using the 1-inch IVC helical scan format, the new recorders feature a 5MHz bandwidth and 400-line resolution (monochrome). ❖

EA CROSSWORD



ACROSS

1 Early Russian satellite. (8)
5 Oldest surviving programmable computer. (6)
10 Image on a screen. (7)
11 Planet invisible to the unaided eye. (7)
12 LA campus of prestigious US university. (1,1,1,1)
13 System that improves tape recordings. (5)
14 Better quality sound reproduction. (2-2)
17 Said of typical nautical use for 27MHz. (7)
19 Einstein's given name. (6)
21 Digital video disc. (1,1,1)
23 Fit fresh conductors. (6)
25 Pattern of circuit used in etching. (7)
29 Physical delivery of correspondence. (4)
30 Brief sounds. (5)
31 Web-page language. (4)
34 Kind of valve. (7)
35 One part of a serial. (7)
36 Amplifier or receiver's front end (abbr). (6)
37 Performs a process repeatedly. (8)

DOWN

1 Soft reactive metal. (6)
2 Greek letter. (7)
3 Name of method used in measurement. (4)
4 Part of computer system's hardware. (8)
6 Narrow slit in tyre tread. (4)
7 Subset of a program. (7)
8 Pauling, Lavoisier, Mendeleyev, etc. (8)
9 Controlling devices. (5)
15 Appliance manufacturer of some note. (5)
16 Emits faint light. (5)
18 Space acronym for outside activity. (1,1,1)
20 Where a pick-up signal is sent to a driver? (4,4)
22 Evaluation procedure that's falling into disrepute. (4,4)
24 Credited with inventing the jet engine. (7)
26 Digital display. (7)
27 Diode always breaking down on the job. (5)
28 Devices used for producing coherent light. (6)
32 Facility for changing focal length. (4)
33 One caught out by a polygraph. (4) ❖

SOLUTION TO DECEMBER 1997:

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Electronics Australia's

Professional Electronics

S ◆ U ◆ P ◆ P ◆ L ◆ E ◆ M ◆ E ◆ N ◆ T

SONY & FUJIFILM DEVELOP BACKWARD-COMPATIBLE 3.5" FLOPPY DISK STORING 200MB

SANDISK & SIEMENS ANNOUNCE 2-10MB 'MULTIMEDIA CARD' OF POSTAGE STAMP SIZE

INTERACTIVE CD-ROM IS TUTOR & REFERENCE ON ELECTRONIC COMPONENTS AND CIRCUITS

SIA FORECAST NEW CHIP BOOM

MOTOROLA'S NEW 'VOICESURFR' VOICE/DATA/FAX MODEMS: VOICE FUNCTIONS-PLUS-SOFTWARE ADDS THE ABILITY TO ACT AS AN ANSWERING MACHINE, HANDS-FREE PHONE & VOICEMAIL TERMINAL — IN ADDITION TO 56K FLEX DATA COMMUNICATIONS

NEWS HIGHLIGHTS

CSC WINS BIG DEFENCE ATM CONTRACT

The Department of Defence has awarded CSC Australia a $4.8 million contract to design and install the largest single-site Defence asynchronous transfer mode (ATM) network in Australia. The network is being installed for the Army Presence in the North (APIN) project in the Northern Territory.

Extending over the 6.6 square kilometres of Robertson Barracks, 20km east of Darwin, the ATM backbone will provide a Base Area Network (BAN) for up to 61 buildings. It will be the first operational system of its type installed by the Army and will have the capacity to operate at 622Mb/s.

Included in the BAN will be two separate networks, one Restricted and one Secret. Eventually it is planned to connect up to 1000 users to the networks.

Captain Ian McDonagh, Project Officer, said: "The ATM backbone will provide an immediate upgrade to communications within the barracks and to locations in Australia and overseas. Just as important, it gives us the capacity to grow without having to make major changes and enhancements to the network."

CSC, who won the contract against strong competition under the Defence Preferred Systems Integrator panel agreement, is prime contractor and systems integrator for a team of subcontractors that includes Com Tech Communications, Cisco and Sun Microsystems. Com Tech will provide network integration services for the BAN which comprises Cisco Catalyst switches and routers and Sun Enterprise servers.

MARINE VERSION OF SATELLITE PHONE

A marine version of Telstra's new MiniSat mobile satellite phone service has been launched, and is claimed to bring high quality voice, fax and data (2400b/s) communications to vessels at an affordable price.

Telstra Mobile Satellite & Radio Services GM Daryll Smith said the marine version of MiniSat helps meet the demand for efficient offshore business communications placed on a nation surrounded by water.

"The whole of the Australian coastline is particularly well covered, with the Pacific Ocean Region and Indian Ocean Region satellites ensuring the MiniSat service is available up to several thousand kilometres offshore", Mr Smith added.

"Vessels will be able to use the MiniSat service to communicate with shore based management knowing that they are using a service which offers the security of digital technology. This is particularly appealing to those people working in the area of law enforcement, such as the water police and customs officials."

The marine version of Telstra MiniSat combines a small transceiver which sits inside the vessel's cabin with a small tracking dome antenna, designed to maintain contact with the satellite while the vessel is moving, installed above deck. Terminal prices start from around $8990, with all inclusive call charges starting from $1.99/minute for calls to and within Australia.

ERICSSON SHIPPING FROM SHANGHAI FACTORY

Ericsson's joint venture factory in Shanghai has started shipping DC-DC converter modules, expanding Ericsson Components' worldwide production capacity by using identical manufacturing and quality processes to the Swedish production lines.

Officially opened at the end of 1996 as a joint venture with the Shanghai Simtek Industrial Company, this important new 1200m^2 facility is majority owned by Ericsson. It offers both a powerful local resource for the Asian market, and a second source globally for many Ericsson Components products, including DC/DC power modules.

The power modules join a number of other Ericsson products being manufactured in the Shanghai plant, and their release for shipment follows extensive technology transfer from Ericsson Components' Swedish factory. The effectiveness and efficiency of the Shanghai facility has enabled the quality and production goals necessary for the highly competitive DC/DC converter market to be achieved very quickly. The energy and ability of the local Shanghai factory staff has been a key element in the successful establishment of automated production, test and burn-in facilities.

Power modules from the ISO 9001 approved Shanghai factory are UL certified, and meet the same rigorous internal test and quality criteria as the other DC/DC power modules from Ericsson Components.

AMD'S NEW K6 WILL HAVE 3D TECHNOLOGY

Forthcoming versions of the AMD-K6 processor will incorporate innovative AMD-3D (TM) technology that will lead the personal computer industry's move to visual computing and establish a "new world order of alternative Microsoft Windows-based platforms", according to AMD Chairman and CEO W.J. (Jerry) Sanders III.

Speaking last year at the 10th annual Microprocessor Forum, Mr Sanders said "Next year, AMD-3D technology will give us an opportunity to distinguish ourselves from Intel and lead the way to visual computing platforms within the Microsoft Windows standard that deliver a near theater-quality experience."

Sanders said the technology will solidify AMD's position as the only company with a realistic opportunity to lead in the development of an alternative platform for Microsoft Windows based computing.

The AMD-K6 3D processor uses new proprietary instructions developed by AMD and supported by Microsoft Direct X and leading 3D game developers. The processor will enable accelerated and enhanced graphics with full-featured MPEG-2 video and AC-3 sound.

Following Sanders' remarks, Greg Favor, AMD-K6 processor chief architect, disclosed technical details of the company's 1998 microprocessor roadmap, including aspects of its 3D technology and mobile platforms and the company's Super 7 Platform initiative to further enhance the Socket 7 infrastructure.

In disclosing AMD's 1998 roadmap, Favor said the company's 0.25um process will enable production of AMD-K6 processors with higher speeds and lower power in a 68mm^2 die size. He revealed that AMD-3D technology incorporates a new set of instructions that provide much higher performance in multimedia algorithms enabling 'real world' modeling on the desktop and a significant performance boost that is visually striking to the end user running AMD-3D enhanced applications. The new technology also accelerates floating-point intensive multimedia operations. The AMD-K6 3D processor will have a transistor count of 9.3 million and a die size of 81mm^2.

The AMD-K6+ 3D processor, scheduled for introduction in the second half of 1998, will add an on-chip 256KB L2 cache, pushing the new K6 transistor count to 21.3 million with a die size of 135mm^2, smaller than the original AMD-K6 processor with 8.8 million transistors. It also will support an optional L3 cache for enhanced performance, while maintaining Socket 7 compatibility and delivering performance up to 400MHz.

Sanders noted that in 1999, AMD plans to begin shipping its seventh-generation processor, the AMD-K7 processor. He said that AMD plans for the AMD-K7 processor to be assembled in a module mechanically interchangeable with Intel's single-edge connector ('Slot 1') module and will feature the bus protocols of the Alpha EV-6 processor. The AMD-K7 processor will be capable of clock speeds higher than 500MHz.

SONY & FUJIFILM DEVELOP 200MB FLOPPY

Sony Corporation and Fuji Photo Film Co. Ltd. have jointly developed 'HiFD', a new 3.5" floppy disk system with a 200 megabyte (both sides) storage capacity. The two firms have developed the new HiFD 3.5" floppy disk system by combining the technologies of both companies to achieve a next-generation high-capacity floppy disk system that features 200MB (formatted) storage capacity, 3.6MB/s transfer rate and backward read- and write-compatibility with current 3.5"/1.44MB floppy disks.

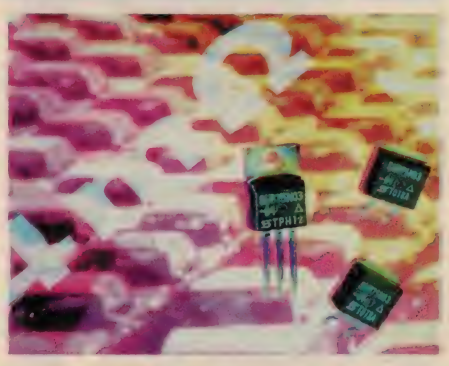
Sony and Fujifilm plan to introduce the system before the middle of this year. The two companies have already received support for the basic specifications of the system from Alps Electric and TEAC Corporation. In the future, Sony and Fujifilm will propose the specifications of the system to a wide range of PC and drive manufacturers. They displayed the system at the COMDEX Fall '97 trade show held in Las Vegas during November.

In 1980, Sony developed the 3.5" floppy disk system which is widely used in computers throughout the industry. In 1992, Fujifilm developed its Advanced super Thin-layer and high Output Metal Media technology (ATOMM technology), which has contributed to the realization of many high-capacity magnetic recording systems (such as Iomega's Zip disks). In addition, both companies have been steady suppliers of high-quality recording media products for many years.

Key to the new 200MB disk technology is the use of a newly developed metal disk with super-thin layer coatings and a dual discrete-gap flying head like those in hard disk drives. The disks rotate at 3600rpm and have a track pitch of 9um.

TEMIC ANNOUNCES NEW 4mΩ TRENCHFET

TEMIC Semiconductors is sampling a new TrenchFET with what is claimed to be the lowest on-resistance of any power MOSFET ever brought to market. The new device, available in TO-220 and D2PAK versions, offers a maximum on-resistance of just 4mΩ (four milliohms) and can handle up to 75A of current. Built on TEMIC's proprietary 32 million-cell TrenchFET technology, the new device is aimed at 30V automotive applications protected by clamp circuitry where low on-resistance is essential.



"When TEMIC released its first 32-million-cell TrenchFETs in the small-outline Little Foot packages several months ago, the industry was interested to see what we could do with this technology when we put it in the larger packages", said Leroy Harper, Executive Vice President of TEMIC Semiconductors' Power Management Product Unit. "What we've done is to create a device that handles more current with less heat dissipation than any other power MOSFET available in any package."

The new TrenchFET also bears the dis-

tinction of being the first power MOSFET to achieve the ULSI (ultra large-scale integration) class of fabrication technology, with more than a million active transistor cells in each TO-220 or D2PAK package.

Typical applications for the new SUP75N03-04 (TO-220) and SUB75N03-04 (D2PAK) will include power trains and body/vehicle control. Because these TrenchFETs can handle more current at the same temperature as less capable parts, they can potentially reduce the number of components needed for HVAC, radiator fans, alternators and positioning motors. They will likewise help to make advanced automotive features more cost-effective for a broader range of cars.

Only six of the 4mΩ TrenchFETs, for example, are needed for an electric steering module that would have required a dozen 8mΩ devices.

DIGITAL SELLS SEMI OPERATIONS TO INTEL

Digital Equipment Corporation and Intel have signed a 10-year agreement which includes the sale of Digital's semiconductor manufacturing operations to Intel for approximately US$700 million. This includes cross-licensing of patents, supply of both Intel and Alpha microprocessors and development of future systems based on Intel's 64-bit microprocessors. According to Digital, the agreement confirms its dual Alpha and Intel platform strategy.

"Our agreement with Intel lets us maximise the value and longevity of our existing Alpha- and x86-based businesses, while providing support for the Intel IA 64 architecture in the future", said Ron Bunker, managing director of Digital in Australia.

If the agreement gets US government approval Intel will purchase Digital's US semiconductor operations in Massachusetts, as well as development operations in Jerusalem, Israel and Texas. Digital will retain its Alpha and Alpha-related semiconductor design teams, to continue developing future generations of this architecture.

SMALLEST SOLID STATE STORAGE MEDIUM

SanDisk Corporation and Siemens AG have introduced the MultiMediaCard (MMC), claimed as the world's smallest solid state storage device. The MMC provides portable data and audio storage to the smallest advanced mobile phones and pagers currently being developed.

With support already from leading telecommunications companies (Ericcson, Motorola, Nokia, Qualcomm and Siemens), SanDisk expects that the MMC will emerge as the portable storage standard for mobile phones, pagers and other handheld products.

The MMC, which weighs less than two grams and is the size of an American 25c coin, was designed to meet the requirements of the portable communications and computing markets. The necessity for the smallest possible physical size card and connector and easy interface to microcontrollers influenced the design of the simple seven-pad card.

The MMC measures 32 x 24 x 1.4mm, which represents approximately one-fifth the volume of a CompactFlash card. First samples will be available this month (January 1998), initially in 2MB, 4, 8 and 10MB capacities. Higher capacity devices will be available in 1999.

The MMC is housed in a simple plastic package with a seven-pad serial interface. The high performance interface offers easy integration into various devices regardless of the microprocessor being used. The write rate is 200KB/s (sustained) while the read rate is 2MB/s (sustained).

SanDisk's popular, small-size CompactFlash storage card is being used in numerous mobile products where interoperability between portable products and desktop computers is critical. These portable products include digital cameras, a market where CompactFlash is emerging as the digital film standard. SanDisk believes that the MMC has the same potential to enable a whole new class of applications in the mobile telecommunications industry where extremely small size, low power and a low cost interface are critical requirements. (Business Wire)

SUCCESS FOR VIC TRAINING SCHEME

Melbourne company Taten Multimedia found the demand for its services as a specialist developer of multimedia and Web based solutions growing rapidly. The company needed more staff, but wanted to be able to train new recruits in a way that suited their approach to web development.

The catalyst for Peter Costello (21) and Taten getting together was the TEAME Multimedia Traineeship, an initiative of the Victorian Government's Training and Employment for Arts, Media and Entertainment Company — TEAME.

With increased emphasis on the need for training that responds to the growth of the multimedia industry, TEAME developed a Traineeship which is relevant to the industry. It offers people a chance to undertake 12 months employment combined with structured off-the-job training.

"Taking Peter on under a TEAME Traineeship allowed us to take on someone we would not normally have and train them to become a valuable part of our organisation", says Taten director Lynda Lim.

When Peter joined Taten he was eager to not only get straight into the

Traineeship but also to be able to work straight away. "I had a diploma of illustration/design work, but it is a hard field to break into and there is a lot of competition especially if you don't have any experience," said Peter.

JAYCAR OPENS IN NEW ZEALAND

Jaycar Electronics has opened its first store in New Zealand. The store is located in Auckland, and stocks the entire Jaycar range of products. It's managed by Jeff Wild, who is from across the Tasman and previously ran Jaycar's Melbourne city store.

Jaycar has extended an invitation to New Zealand customers to drop into the new store, located at 14A Gillies Avenue, Newmarket, Auckland; phone 529 9916, or fax 529 9917.

FIRST ON-BOARD FUEL CELL UNVEILED

The US Department of Energy and Arthur D. Little, in conjunction with Plug Power and the Energy Department's Los Alamos National Laboratory, have successfully demonstrated what is claimed as the first-ever gasoline-powered 'fuel cell' electric engine for the automobile. The new technology will allow the automotive industry to create new fleets of vehicles that can realize up to 80mpg (miles per gallon) fuel economy with a near-zero exhaust emissions.

This is said to be the first time that fuel cell electricity has been generated by hydrogen from gasoline in a module that can be placed aboard a vehicle. The innovation heralds the next generation of engines to replace the internal combustion engine.

"Technology is increasingly important as the nation focuses on environmental protection and climate challenges," said US Secretary of Energy Federico Pena. "Today's breakthrough is just one example of cutting-edge technology that could be commonplace in the future — reducing greenhouse gases and improving the air we breathe."

Fuel cells generate electricity through an electro-chemical process. The cell converts the chemical energy of hydrogen and air (oxygen) into electrical energy. The by-products of this process are water vapour and heat. This system produces negligible amounts of sulfur and nitrogen oxides and less than half the amount of carbon dioxide greenhouse gas compared to internal combustion engines.

Because of the ecological and cost benefits of fuel cells, car makers have been scrambling to create a fuel cell technology to replace today's internal combustion engine. However, storing hydrogen, the key ingredient needed to produce the electricity that powers an on-board vehicle fuel cell, is not easily achievable in any practical or cost effective automotive system. By using gasoline in the on-board fuel processor, vehicles may now be able to house smaller gasoline tanks because of the increased efficiency of fuel cells. The fuel can also operate with ethanol derived from corn and other hydrocarbons.

The discovery is the result of a five-year program sponsored by the US Department of Energy. The department partnered with Arthur D. Little, the project lead in advancing the development of on-board fuel processors and proving that fuel cell-based power systems are viable alternatives to traditional internal combustion engines. The State of Illinois and the Illinois Corn Marketing Board have also been partners in the development effort of creating new possibilities for cleaner and more efficient transportation for the 21st century.

Arthur D. Little and Plug Power will work together under a $15 million cost-shared contract recently awarded by the Department of Energy to further develop this technology. ❖

JOHN MOLL WINS C&C PRIZE

Physicist John L. Moll, who played a seminal role in semiconductor development during his career at Bell Laboratories, Stanford University, Fairchild Camera and Instrument and HP Laboratories, has been awarded the 1997 C&C Prize, which carries a cash prize of US$80,000. The Foundation for C&C Promotion in Tokyo, which awards the prize for advances in the integration of computers and communications technologies, cited Moll for his 'contributions to the physics of semiconductor devices'.

As a member of the technical staff at Bell Labs from 1952 to 1958, Moll led a small group of scientists and engineers seeking a new technology to replace vacuum tubes and relays in the central offices of the telephone system. The group's pioneering work led to the identification of silicon as the most appropriate material for semiconductors and to the development of the Ebers-Moll transistor model. This model simulates the way a transistor works and remains fundamental to the manufacture of today's large-scale integrated circuits.

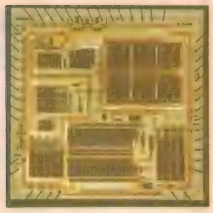
Moll left Bell Labs in 1958 to become a professor of electrical engineering at Stanford University, where he researched the physics of silicon devices. In 1969, he became technical director of the optoelectronics division of Fairchild Camera and Instrument. He joined HP in 1974 as director of integrated structures research and later worked at HP Laboratories as associate director of the superconductivity laboratory (1987-1990) and as a distinguished contributor, HP's highest technical position (1990-1996). He retired from HP Laboratories in December 1996.

NEWS BRIEFS

- The post office box address for ***Analog Devices*** has changed. The new postal address is Analog Devices Pty Ltd, PO Box 2098, Rosebud Plaza, Vic 3939. All other details remain unchanged.
- The Melbourne office of ***Vicom Australia*** has moved to 1064 Centre Road, Oakleigh South, Victoria 3167, phone (03) 9563 7844, fax (03) 9579 7255, email vicom@vicom.com.au
- ***Motorola's Semiconductor Products*** has announced a new regional structure in the Asian region. Mr Carlos Genardini is now senior vice-president and general manager of Motorola's Global Consumer Systems Group, based in Hong Kong. Mr Joe Yiu is now vice president and general manager of Motorola's Asia Pacific region headquartered in Hong Kong. ❖

Solid State Update

KEEPING YOU INFORMED ON THE LATEST DEVELOPMENTS IN SEMICONDUCTOR TECHNOLOGY...



Single-chip digital modem

Analog Devices has announced the ADSP-21mod870, claimed to be the first complete digital modem on a single chip. According to the company, the single-chip design will change the infrastructure of the Internet by significantly reducing the size, power consumption and cost of modems for remote access server (RAS) OEMs.

Current RAS modem solutions require multiple chips, so a major benefit of the new device is that 24 to 48 modem ports can fit in a space that now holds 12. The chip measures 10mm square and consumes 140 milliwatts per port.

The ADSP-21mod870 is based on digital signal processing (DSP) technology that enables the chip to be programmed on the fly to handle any modem protocol such as V.34, 56kbps, fax and ISDN. It includes 64K words of high speed SRAM and the communication protocol code is available from ADI and third parties.

For further information circle 271 on the reader service coupon or contact Analog Devices.

TruSurround IC has a broad 'sweet spot'

Medianix Semiconductor has introduced the MED25008 TruSurround digital audio processor. The chip is claimed to create the broadest virtual surround sound 'sweet spot' currently available, and to suit applications such as TVs, self-powered multimedia speakers and home theatres, in which only two speakers are available.

With TruSurround technology, realistic 3D sound imaging is created with two loudspeakers, enabling sounds to appear to come from any point in three-dimensional space surrounding a listener. The speakers don't need to be angled to achieve an optimum effect, an alignment that reduces their soundstage.

The IC is based on Medianix' proprietary 24-bit digital signal processor (DSP) and incorporates a Dolby Pro Logic decoder front-end and a TruSurround virtualiser post-processor. Head related transfer functions (HRTFs), which are algorithms based on the natural characteristics of the human hearing system, are used on both the front and rear surround channels to synthesise virtual surround speakers to the side and rear of the listener.

For further information contact Medianix Semiconductor Inc, 100 View Street, Suite 101 Mountain View, CA 94041; fax (415) 960 0478.

280MHz amplifier can drive 160mA

Analog Devices has introduced the AD8010, a high-current output, high-speed amplifier. Capable of driving 160mA of output current, the new amplifier can source eight parallel 75Ω loads or more while maintaining its video specifications.

The new amplifier's current feedback design gives a total harmonic distortion (THD) of -72dBc at 1MHz, and gain is flat to within 0.1dB up to 40MHz, with differential gain error of 0.02% and differential phase error of 0.03°. It features a 280MHz (-3dB) bandwidth, an 800V/us slew rate, and an output swing of +/-2.5 volts. It uses a +/-5V dual supply and consumes 16mA of supply current. The device is designed for video distribution amplification applications, and for drive amplification within high data rate digital subscriber line systems.

For further information circle 276 on the reader service coupon or contact Analog Devices.

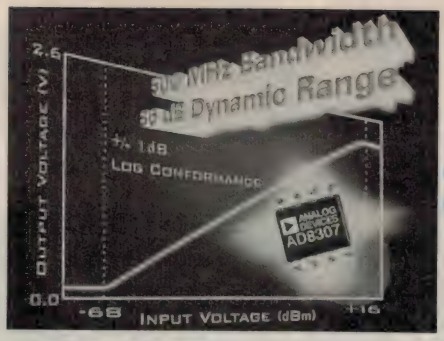
Custom dual-sided COBs

Ampec Technologies has introduced dual sided chip-on-board (COB) devices for communications, computer and instrumentation applications. Manufactured by Aries Electronics to customer specifications, the devices' multilayer construction (up to 20 layers) enables designers to reduce circuit size and thus increase circuit density without an increase in weight. Using standard FR4 material for the substrate, Aries' PCB provides chip-and-wire mounting on the top side and surface mount connections on the bottom. Thermosonic gold bonding is standard and ultrasonic aluminium wedge bonding is also available.

For further information circle 275 on the reader service coupon or contact Ampec Technologies P/L, 4 Wetherill Street, Silverwater, NSW.

500MHz log amp

Analog Devices has released a 500MHz logarithmic amplifier with a dynamic range of 86dB and an accuracy of +/-1dB in an eight-pin SOIC package. A log amp is a key building block in a wide range of radio frequency (RF) applications. Most RF systems require two mix-down stages, one to intermediate frequency (IF) and one to baseband. Since the new device eliminates the need to mix down to baseband, the last mixing stage can be eliminated.

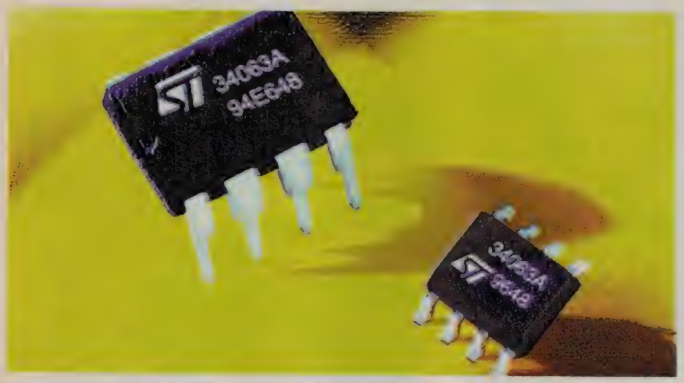


The IC is designed to determine the power level (in volts) of a wide dynamic range input signal and is therefore a useful component for circuits measuring received signal strength (RSSI) and/or transmitted radiated power (TSSI). Applications include communications, low-cost radar and sonar signal processing.

For further information circle 273 on the reader service coupon or contact Analog Devices.

8V surge protector

SGS-Thomson Microelectronics has introduced the SMP75-8, a very low voltage bi-directional transient surge arrester to provide primary protection in T1/E1 digital telephony and similar applications where high speed digital signals are exposed to lighting induced surges and other transient voltages.



Digital T1/E1 trunks are rapidly replacing conventional analog lines, due to their low cost and superior performance. As a result, these lines are now being increasingly used outside the protected environment of the telephone company, making it essential for line cards to have adequate transient protection.

The device is used on the primary side of the transformer, and provides an efficient crowbar protection, due to its low stand-off voltage of 8V, a peak pulse current rating of 75A, and a maximum breakover voltage of 15V. Typically, a line card crowbar protection function is complemented by two other devices: the DA108S1 diode array and the SMBJ6.0A Transil diode to clamp surges coupled onto the power supply.

For further information circle 277 on the reader service coupon or contact SGS-Thomson Microelectronics, Suite 3, Level 7, 43 Bridge Street Hurstville 2220.

15V & 24V input 1W DC/DC converters

Burr-Brown's new DCP0115 and DCP0124 families are high efficiency, 15V and 24V input isolated DC/DC converters featuring a 1W nominal galvanically isolated output power capability and a fully synchronisable range.

Both products feature thermal shutdown and overload protection via watchdog circuitry. The company claims the converter's advanced power-on reset techniques give superior reset performance and that the devices will start into any capacitive load up to a full power output. They are suitable for a variety of industrial applications including point of use power conversion, ground loop elimination, data acquisition, industrial control and instrumentation, and test equipment.

For further information circle 272 on the reader service coupon or contact Kenelec, 2 Apollo Court, Blackburn 3130.

18GHz transistors

Philips has introduced a new range of high-performance low-voltage silicon bipolar RF transistors for use in the latest 1.8GHz cordless and cellular telephones. Fabricated using a recently developed 'double-poly buried-layer' process, the range currently includes small signal and medium power types with collector current ratings suitable for use in all stages of a mobile phone's RF transceiver, including its low-noise input amplifier, mixer, VCO and RF power amp driver. All types are optimised for use on 3V supplies, but still perform well at supply voltages as low as 1V. Typical applications for these transistors include DECT, PHS, DSCS1800 telephone handsets, satellite receivers and pocket pagers.

The device transition frequencies (f_T) of between 18GHz and 22GHz are an order of magnitude greater than the operating frequency of current wireless communication systems. When operated in common-emitter configurations at the optimum part of their gain-bandwidth characteristic, the small-signal types have gain values in excess of 20dB at a V_{CE} of 3.6V and a frequency of 2GHz.

For further information circle 274 on the reader service coupon or contact Philips Components, 34 Waterloo Road, North Ryde 2113. Internet at **http://www.semicondutors.philips.com**

CATV amplifiers

Four new hybrid cable TV amplifiers claimed to provide the industry's highest output capability have been introduced by Motorola. Aimed at 860MHz and 750MHz cable television (CATV) applications, the units are based on Motorola's new submicron die technology. The amplifiers are said to feature superior gain, return loss and RF stability margin.

The four amplifiers, types MHW7185C, MHW8185, MHW7205C and MHW8205, provide operating frequencies from 40 to 750MHz for 110-channel performance and 40 to 860MHz for 128-channel performance. They are housed in a conventional CATV package that offers compatibility with other standard devices. Typical gain is around 20dB at 750MHz.

For further information circle 278 on the reader service coupon or contact Motorola Australia, 673 Boronia Road, Wantirna 3152. ❖

A very logical prize!

TOTAL PRIZE VALUE
$7,910

HEWLETT PACKARD

Hurry!

Win one of 7 HP LogicDarts

Electronics Australia and Hewlett-Packard are giving away 7 HP LogicDarts valued at $1,130 each. _Total Prize Value $7,910._

The HP LogicDart is an advanced logic probe that not only performs basic logic monitoring and analysis, but also tests continuity and measures frequency and dc voltage, eliminating the hassle of switching tools and keeping you focused on solving problems. It's the perfect tool for first-level troubleshooting.

Features include:

* Single probe to make required measurements.
* Precise probe tip which allows you to probe fine-pitch surface mount circuitry.

How to enter:

Simply subscribe or renew your subscription to *Electronics Australia* for the discount price of only $49, (saving you $22.40 on the normal cover price) and you will receive automatic entry into the draw to win one of these seven Hewlett-Packard LogicDarts.

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Conditions of Entry. **1. The competition is open to Australian residents authorising a new or renewed subscription to *Electronics Australia*. Employees of the Hannan Group, Hewlett-Packard, their subsidiaries and families are not eliible to enter. 2. Prizes are not transferable or exchangeable and may not be converted to cash. 3. The judge's decision is final and no correspondence will be entered into. 4. The competition commences on October 13, 1997, and closes last mail on January 20, 1998. 5. The draw is at the promoter's premises on February 3, 1998 at 11am and the winners will be announced in the May 1998 issue of Electronics Australia, on sale April 23, 1998, and notified by mail. 6. The prize is one of seven Hewlett-Packard LogicDarts, valued at $1,130 each. Total prize value is $7,910. 7. Subscriptions are not refundable. 8. The promoter is the Federal Publishing Company, 180 Bourke Rd, Alexandria, NSW 2015. 9. All entries become the property of Federal Publishing, and may be used for future marketing purposes. NSW Permit No. TC97/7023; ACT Permit No. TP97/0658; NT Permit No. NT/97/pending; SA Permit No. T6831. VIC Permit No. pending.**

Offer Ends January 20, 1998

NEW PRODUCTS

EMC test system

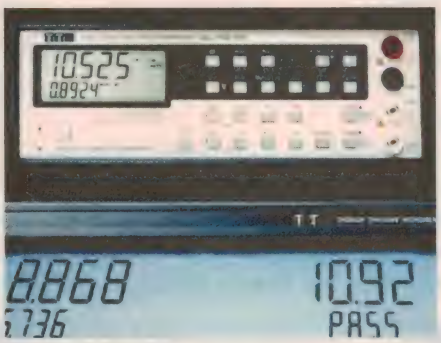
Schaffner has released the Best Plus, a 'six in one' EMC emission and immunity test system for full compliance testing of industrial, residential and commercial equipment. It combines a multi-function generator providing burst to 2.2kV/100kHz; electromagnetic discharge to 8.8kV ESD; surge to 2.2kV/1100A; and power quality pulses, for power line and data line compliance.

It comes with a ground plane, cables, ground strap, grounding resistor and coupling clamp for data line testing, and an instruction manual. Test options also include power frequency magnetic field testing (to 30A/m) and pulsed magnetic field testing (to 1100A/m, using 1.2/50 pulses) as well as upgrades to full IEC level 4 specifications (burst to 4.4kV/up to 100kHz; surge to 4.4kV/2200A). It can be used by non-specialist personnel and has a universal interface/coupler to connect to the product being tested. Pre-programmed tests using built-in test pulses then run the compliance testing procedure.

For further information circle 242 on the reader service coupon or contact Westek Industrial Products P/L, Unit 2, 6-10 Maria Street, Laverton North, 3026.

Multimeter makes two measurements at once

The new Thurlby Thandar 1705 benchtop multimeter can simultaneously measure two parameters from its analysis program of voltage, current, resistance, capacitance (four ranges up to 120uF) and frequency



(10Hz to 120kHz). The instrument's dual display can show two parameters such as the ripple component of a DC voltage as well as its DC value, or current and voltage in a circuit. Measured and calculated parameters including AC voltage and decibels, or functions of the form (Ax + B) and computation of watts or VA as well as percentage deviation from an operator-chosen nominal value can also be displayed.

A built-in logger can store up to 100 readings at rates ranging from one reading per second to one reading every three hours, with a min-max function to store highest and lowest values of the readings. For production testing, high, low and pass parameters can be displayed. An RS-232 interface is supplied as standard and an optional GPIB interface is also available.

For further information circle 241 on the reader service coupon or contact Nilsen Technologies, 150 Oxford Street, Collingwood 3066.

Hot wire anemometer is self-calibrating

The new Digitron AF210 hot wire anemometer is claimed to give precise measurement of low air velocity and temperature. It is based on Digitron's microprocessor technology, and measures air flow in the range of O-5 metres per second plus temperature to 80°C.

A new feature is that the instrument is self-calibrating at switch-on, so probe units are interchangeable. In the event of a probe failure, a new probe can be simply plugged in without needing to send the instrument away for calibration.

The instrument has a heated element over which the gas or air flows. Heat is extracted from the hot sensor but its temperature is kept constant by regulating the power to the sensor. The power required to keep the element at a constant temperature is thus a function of the gas velocity. The instrument has a quoted accuracy of +/-0.1% over its measurement range. Applications include HVAC service and installa-

tion, air balancing, laboratory measurements, and clean room environment measurement.

For further information circle 244 on the reader service coupon or contact Zenology Sales P/L, Suite 7, 1st Floor, 245 Springvale Road, Glen Waverley 3150.

ADC has sample-&-hold amp

The ADC4216 is a 16-bit, 1MHz A/D converter with a built-in sample-and-hold amplifier. It is designed for use in applications requiring high speed and high resolution front ends such as ATE, medical imaging, radar, communications and analytical instrumentation.

It provides an 84dB signal-to-noise ratio and a spurious-free dynamic range of 93dB. In the time domain, it is guaranteed to have no missing codes over the operating temperature range. It has a power consumption of 1.65W and is designed around a two-pass, subranging architecture that integrates a low distortion sample-and-hold amplifier, precision factory-trimmed voltage reference, and all necessary timing circuitry. It has full parallel, buffered output data, and comes in a 50 x 75mm package.

For further information circle 251 on the reader service coupon or contact Obiat, PO Box 37, Beaconsfield 2014; phone (02) 9698 4111.

SM components in smaller quantities

For years, component manufacturers have packaged surface-mount components on large reels for high volume production. Resistors are typically on 5000-piece reels and capacitors on 4000-piece reels, and suppliers are often unwilling to break full reels in order to supply smaller quantities. This can pose problems for smaller manufacturers, and even larger manufacturers wanting to produce smaller runs of specific products. Even if the supplier is prepared to break a reel and supply 1000 pieces, the shorter length of carrier tape is often simply cut off and coiled in a bag without a reel — causing problems with pick-and-place machines.

MiniReel Components offers a better solution, by making available a wide range of SMD components on 4" (100mm) miniReels, suitable for low volume production. Typical reels contain 1000 resistors, or 500 ceramic capacitors, transistors or diodes. The reels all have a leader tape as required by pick-and-place machines. For prototyping and manual assembly, even smaller quantities are available in 'miniBags'.

A full range of SMD components is available, including ceramic capacitors, tantalum capacitors, aluminium electrolytics, resistor networks and arrays as well as chip resistors, quartz crystals, inductors, ferrite beads, fuses, bridge rectifiers, LEDs, MELF diodes, transistors and diodes, and EMI filters.

For further information circle 249 on the reader service card or contact distributor TRI Components, 1/32 Miles Street, Mulgrave 3170.

Programmer & SBC

Oztechnics has introduced the Oztec-11, a combined programmer and single board computer built around the Motorola MC68HC11 microcontroller. The board features a 52-pin PLCC ZIF programming socket, 32K of SRAM, 8K of EEPROM, address/data bus access for off board expansion, 60-pin I/O header, LCD port, 26 general purpose I/O lines

(three input captures, five output compares), pulse accumulator, real-time interrupt, watchdog timer, two external hardware interrupts, eight channel 8-bit A/D, three-wire serial peripheral interface and two serial interface ports.

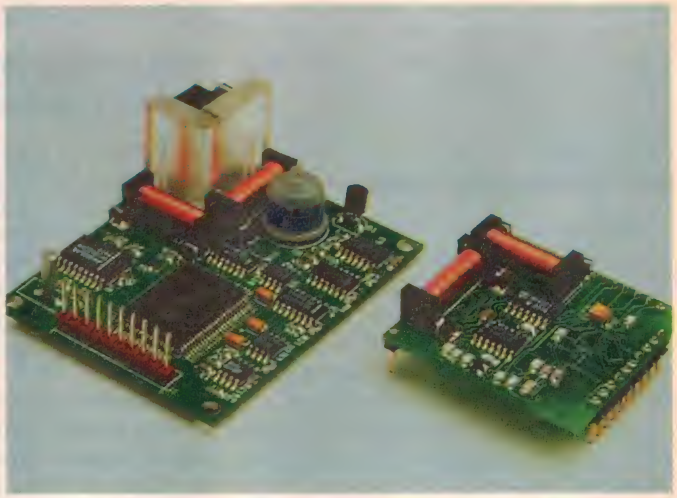
The board interfaces to a PC via its serial communication port, and to the user application via its 60-pin input/output expansion connector. The board suits development of data acquisition and process control systems, and is supported with a software package that includes an integrated text editor environment shell (ITEE), assembler, simulator, monitor and sample code.

For further information circle 256 on the reader service coupon or contact Oztechnics P/L, PO Box 38, Illawong 2234; phone (02) 9541 0310, Web site **http://www.oztechnics.com.au/**.

Electronic compass modules

The Vector 2X and Vector 2XG are complete compass or magnetic sensor modules, said to be easily integrated into any system. The modules each use two magneto-inductive sensors to sense magnetic fields. These sensors change inductance with the applied magnetic field strength.

Compass applications for the Vector 2X include car navigation, backup azimuth for GPS, vehicle tracking and vehicle location. Typical compass applications for the Vector 2XG include satellite antenna positioning systems, meteorological equipment, surveying systems and marine electronics. The Vector 2X can also be used as a magnetic sensor for vehicle detection, seismic surveying and metal detection.



Also available is the TCM2, a module that uses a solid state electronic compass, a three-axis magnetometer and a two-axis tilt sensor. Output of the modules is via a three-wire serial format (compatible with Motorola SPI and National Microwire) at either 2.5 or five times per second.

For further information circle 258 on the reader service coupon or contact Sphere Innovative Technologies, PO Box 380 Darlinghurst 2010. ❖

Product review:

IRODA 'SOLDERPRO' BUTANE SOLDERING IRON

New from Altronic Distributors is the Iroda Solderpro gas powered soldering iron. Unlike others on the market, the Solderpro is rated at an impressive 120 watts, and can easily be converted into a blowtorch. If you've ever needed a lot of watts whilst out in the sticks somewhere, this could be just the thing...

by GRAHAM CATTLEY

If you have ever needed to solder in a remote location away from a power point, or needed to do some electrical work on the car, then you'll appreciate the flexibility of a gas powered soldering iron. Smaller butane irons have been around for years, but they do tend to suffer because of their small tank size and limited heat output.

The Solderpro butane iron from Iroda certainly overcomes these limitations, with a rated output of 120 watts. It is around 250mm long and with a full tank weighs around 180g, with the bulk of the mass situated low down in the handle. A large red sliding actuator on the upper body switches on the gas flow, and also activates the piezoelectric ignition system — which means you can pick up the iron, start the gas flow and light it all with one hand. A thumb operated flow control valve acts as a temperature control, and is quite easy to use.

Trying it out

Personally, I quite like the idea of gas irons, and have used a smaller model for many years — mostly for little jobs which didn't warrant dragging out the big soldering station.

To try out the Solderpro, I decided to give it a go on my bench instead of my usual low voltage iron, just to see what the limitations might be.

The first point that came immediately to light was that you must use some form of heatproof soldering iron stand. The initial temptation was to rest the iron down flat on the bench, with the tip sitting around 15mm above the bench. I could get away with this with my smaller gas iron, but with the Solderpro the hot gasses escape from a narrow slot in the tip, and this can scorch the area directly under the iron.

Unfortunately, this exhaust gas tends to heat components as they are being soldered as well, and at one stage I found that the board I was working on was getting too hot to touch, as a result of the gasses being directed onto it by the iron. Added to this was the fact that butane exhaust fumes aren't terribly palatable, and after about 10 minutes I had to stop to get some fresh air.

This all points to the fact that the iron wasn't designed to be used for everyday soldering work indoors, but rather for one-off, heavy duty applications — and preferably outdoors.

The iron is rated to run for 3.5 hours at its mid setting, and a clear plastic section at the end of the tank lets you see how much (liquified) gas is left. Spare tips are available, along with a marvelous blowtorch tip that can produce a flame up to 30mm long. (The lower settings are great for heatshrink sleeving, by the way.)

So all up, the Solderpro is a handy little iron that you can keep in your toolbox for those heavier jobs, and with the supplied blowtorch tip you can do a lot of work that you wouldn't even attempt with a normal electric soldering iron. ❖

Iroda Solderpro

A heavier-duty butane powered soldering iron which comes with a 2mm plated soldering tip, as well as a separate blowtorch tip.

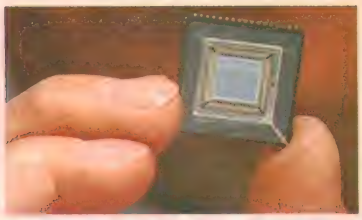
Good points: High power, and the ability to switch to a blowtorch for really big jobs.

Bad points: Can easily burn the table top or nearby components — make sure you use a stand, and angle the bit so the exhaust gasses are directed away.

RRP: $129. Spare tips are available for $15.95 each.

Available: Altronic Distributors, Head office at 174 Roe St., Perth, WA 6000. Phone (08) 9328 2199. Branches in Melbourne (03) 9574 0065, and Sydney (02) 9648 5266.

Silicon Valley NEWSLETTER



Faster graphics rendering technique

Silicon Graphics has developed what is described as a radical new 'RealityMapping' 3D software rendering technology that it claims outperforms traditional ray tracing techniques by a factor of 20,000 times.

RealityMapping uses a technique called 'tri-beam reflection mapping', which enhances industrial design workflow by providing interactivity and high-quality imagery for working with extremely complex models. The technology combines this processing with the visualisation power of SG's Onyx2 InfiniteReality visual supercomputer.

"Silicon Graphics has enabled a quantum leap in vehicle design productivity for Renault and other companies," said Bruno Simon, CAD manager of Renault's Industrial Design Department. "The ability to instantly view and interact with models that previously took hours to render enables Renault to achieve a competitive and creative advantage as we design our next generation of automobiles."

Microsoft upping investment in cable

Microsoft is reportedly in the advanced stages of negotiations with US West, the third largest cable operator in the US, with a view to investing US$1 billion in return for a 6.3% equity position in the cable operator.

Last year Microsoft invested US$1 billion in Comcast, the fourth largest cable operator, gaining an 11% stake. Microsoft has also been in discussions with Tele-Communications Inc. (TCI, the top US cable provider).

Despite some concerns over Microsoft's entry into the cable industry, the move is generally welcomed. "This is a nod to reality", said Stephen Effros, president of the Cable Telecommunications Association, an industry group in Washington. "The computer industry realises that cable will become the means for speedy Internet access."

IBM announces Internet virus cure

IBM researchers claim to have developed a high tech cure for an ever-larger high tech problem: computer viruses roaming around on the Internet. A team of computer scientists at IBM's renowned Watson Research Laboratory in New York told an anti-virus conference in San Francisco that they have developed a cure against viruses on the Internet.

The 'Cyberspace Immune System' as the technology is called, was modeled after the human immune system according to Steve White, who is head of IBM's anti-virus engineering team. Like cells that roam the body looking for bacteria and viruses and giving the information to the liver where white blood cells are coded to kill the intruders, the CIS uses special software that is designed to spot virtually any type of computer virus. Upon detection, the software instantly reports the bug to the network's system administrator who, via the Internet, transmits a clean copy of the virus to IBM's central CIS system in New York where the bug is automatically diagnosed.

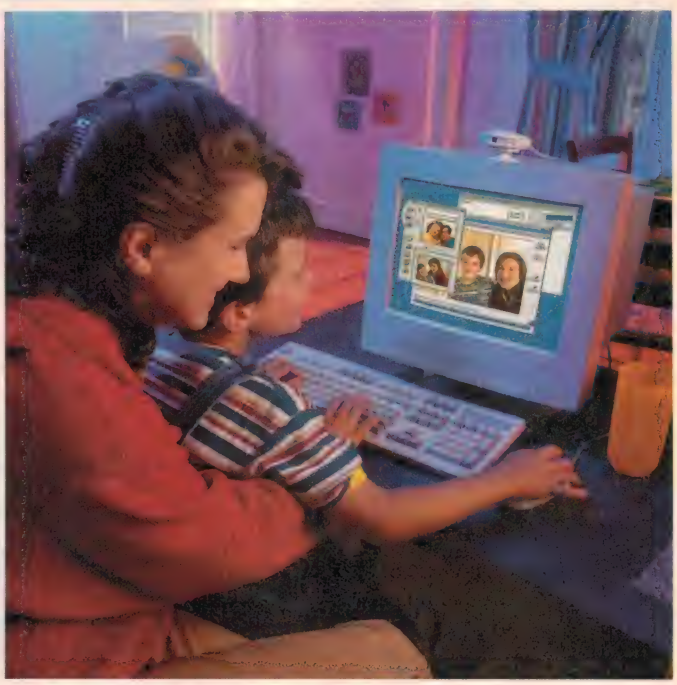
If it is a known virus, a cure is pulled from the database and installed on the desktop where the bug was detected. If it is a new virus for which a cure is not already available, the Lab's computers are designed to quickly develop a cure which is transmitted both to the original desktop as well as to IBM's worldwide customer base, innoculating their systems for that particular virus.

"This is the first anti-virus technology that kills a virus faster than it can spread", said White, adding that the CIS system is the first full-circle, fully automated virus detection and eradication solution.

Robot market slows down

The workforce of industrial robots would grow by only about 30,000 units in 1997, an increase of only 4% to US$5.3 billion in sales, according to the UN Economic Commission for Europe (ECE). The slowdown from 1996, when robot sales grew 11% (nearly 81,000 units) was due to a sharp decline in the German market and a slowdown in growth in Japan, France and Britain. The US market, on the other hand, continued to show strength with a 10% expansion in 1997.

Since industrial robots were introduced in the late 1960s, nearly 860,000 have been sold. Currently, an estimated 680,000 robots are in active service worldwide. That number will climb to one million by the year 2000, representing annu-



Intel's new 'Create & Share' pack is an easy to use, all-in-one communications, photo and video editing package for PCs with Pentium 90 or better processors. It includes an Intel PC camera, hardware and an integrated suite of communications and image editing software to allow users to make, enhance and organise snapshots and videos for printing, viewing or sending to others on the Web.

al sales growth averaging 15%. The largest number of robots (400,000) are deployed in Japan, where robots make up some 20% of the motor vehicle industry's labour force. Japan also has the highest density of advanced robots, with 225 units per 10,000 persons employed in manufacturing, followed by South Korea with 75 units and Germany at 71.

McCracken resigns as Silicon Graphics CEO

Ed McCracken, one of Silicon Valley's most highly regarded high-tech industry executives and technology visionaries, has announced his resignation as chief executive officer after 13 years on the job. However in an unusual move, he agreed to stay on indefinitely as chairman and as interim CEO until a replacement has been found.

Silicon Graphics' board even endorsed McCracken's plan for restructuring the high-tech company's basic business plan, and changing the company from a high-end graphics workstation vendor into one that will focus on selling powerful workstations and servers for general business applications. The company also announced a restructuring program that will include a workforce reduction of around 1000 people.

Analysts speculated that McCracken may well end up at Netscape Communications, the home of James Clark, co-founder of Silicon Graphics. Others said McCracken could be the executive Apple Computer has been looking for.

Under McCracken, Silicon Graphics established a reputation as the world's leading advanced graphics workstation company.

SIA forecasts new boom in chip sales

After a modest 5.5% gain to US$139.2 billion, the global semiconductor market is due for a new period of robust growth that will take the industry to sales of US$233 billion in 2000, according to the Semiconductor Industry Association at its annual forecast dinner in San Jose late last year. The group also celebrated its 20th anniversary, as well as the 50th anniversary of the invention of the transistor.

Lucent Technologies' Microelectronics Group president Curtis Crawford, who presented the 1998 forecast before a packed room of 1000 semiconductor industry executives, said chip sales will increase 16.8% in 1998 to US$162.6 billion, with double-digit growth returning again in 1999 and 2000. "Every day, new miracles are being carried out by an estimated 200 quadrillion (200 million trillion) transistors that are in operation around the world. That equates to about 40 million transistors for every human on the planet. The transistor is the foundation of one of the world's most dynamic industries."

George Scalise, president of the SIA added "1997 can be characterized by one word — recovery — and 1998 should be even better for the semiconductor industry. We are confident that based on the world's fascination with IC products, our industry's historic double-digit growth rates will resurface in 1998."

Much of that forecast is based on a rebound in the fortunes of the DRAM market, which have been a huge drag on the chip market's growth. While demand for DRAMs continues unabated, excess capacity is keeping prices at low levels. Excess capacity will continue into 1999, Crawford predicted.

Cisco profits soar

There appears to be no stopping or slowing down Cisco Systems from extending its leadership in the networking market. The San Jose company has reported a whopping 86% jump in quarterly profits, to US$337 million. Sales rose 30% to US$1.87 billion from $1.45 billion. Profits would have exceeded $416 million if it hadn't been for a charge of $127.2 million in connection with Cisco's acquisition of DAGAZ Technologies, which makes products to deliver high-speed data, voice and video services over existing telephone lines.

"We believe our growth rate indicates that Cisco continues to gain market share against our traditional competitors in most product sectors", said John Chambers, Cisco's CEO.

Billion-dollar loss for Apple in 1997

Fiscal 1997 is a year Apple will likely want to forget, as its sales declined by nearly a third and losses totalled US$1 billion, including a fourth quarter loss of $161 million on sales of $1.6 billion — down from $2.3 billion a year earlier. The loss was larger than expected, although it included a $62 million charge to cover restructuring expenses and $75 million for the purchase of the Mac OS license from Power Computing.

Apple's chief financial officer Frank Anderson focussed on the more positive aspects of the company's business, including US$500 million in revenues from education-related institutions. Apple also sold more than two million copies of its new Mac OS8 operating software. Demand in the US was up, in both the consumer and corporate sales groups. However international sales proved disappointing in the quarter, Anderson said.

Apple's profit margins suffered from a shift towards lower margin PowerPC-based systems. "We feel optimistic about the next year. We continue to pursue the return to profitability as the major goal", Anderson said, but added that "I am out of the business of predicting profits. Our goal is to get back to sustainable profits as soon as possible."

For the year, Apple's sales were only US$7.1 billion, 28% below fiscal 1996 revenues. The net loss for the year was $1.0 billion.

Demand recovers for LCD panels

Increasing demand for car-navigation systems, camcorders, digital cameras and personal digital assistants has helped sales of LCD display grow at a 20-25% rate in the second half of 1997.

"The LCD business is clearly on a growth track", said Taizo Katsura, senior vice president of Sharp Electronics.

Demand for LCDs took an unexpected downturn earlier in the Japanese fiscal year which starts in April as portable PC sales flattened.

ISO committee turns down Java — again

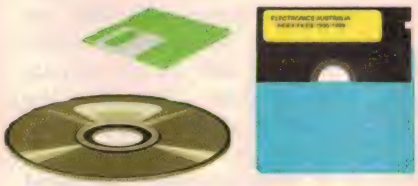
Sun Microsystems suffered a setback in its effort to gain international standard recognition for its Java Internet programming language, when the US Committee of the International Standards Organization (ISO) voted against a proposal to make Java an industry standard. It was the second time in four months the committee denied the Sun petition.

Sun had hoped to gain ISO approval, as such recognition would have helped boost the acceptance of Java worldwide, particularly in countries where regulations either demand or favour the use of ISO-approved products and services. Approval would likely have resulted in a boost in investments in Java-based application and product development.

Ironically, the ISO committee took its vote while meeting at the headquarters of Microsoft, Sun's chief rival. Microsoft, along with Intel, Digital Equipment and Compaq have strongly opposed ISO approval for Java, as long as Sun owns the technology. ❖

SPOTLIGHT ON

SOFTWARE



Educational/reference CD-ROM from Matrix

If you have more than a passing interest in electronics, you have probably acquired a number of books on the subject. The trouble is that such books tend to be boring, and so are left on the shelf. Matrix Multimedia seem to have fixed all that with two new textbooks on a CD-ROM. With an audio narration, interactive circuit controls, and the ability to link in with circuit simulation software, the two books come across very well indeed...

by GRAHAM CATTLEY

Textbooks come in all shapes and sizes, and so it was probably inevitable that they should eventually appear on CD-ROM. Emona Instruments are now supplying *The Parts Gallery* and *Electronic Circuits & Components — an introduction*, both written by Mike Tooley and published by Matrix Multimedia.

The two titles are supplied on the one CD-ROM, and are the first two in a series of four multimedia textbooks designed to cover the subject of electronics up to first year university level.

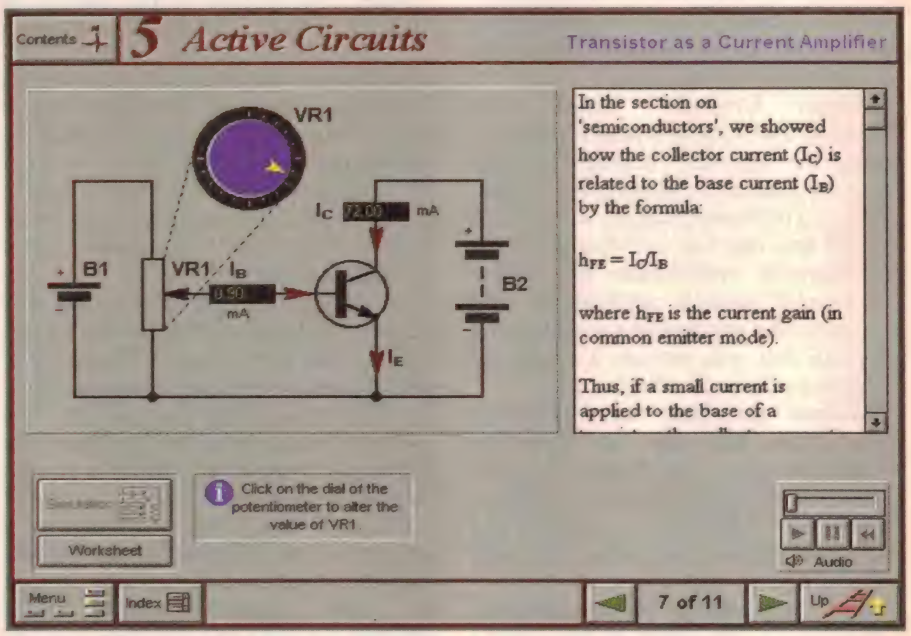
Produced in the UK, these textbooks present as a series of pages grouped into sections or 'chapters', accessed by clicking the mouse on the appropriate button. The whole production is very polished and is remarkably intuitive and easy to drive.

The CD-ROM comes with installation instructions printed on the insert inside the CD's case. You'll need a minimum of a 486 system running Windows 3.1x with 8MB RAM, in order to get it up and running.

The only quirk that I came across during installation was when it asked me if I wanted a full or custom installation. A full installation takes up around 14MB, and being a bit short of disk space, I selected custom. I then had the option of installing the two programs Parts Gallery and Electronic Circuits & Components, as well as several other files. The problem I had was that there was no information on what these other files were for or what they did, so I had to back out and run the full installation instead.

The Parts Gallery

The Parts Gallery was the first program I tried, and it brought up a main menu screen with a row of five large buttons down the left hand side, labeled Components, Component Quiz, Symbols, Symbol Quiz, and Circuits.



A typical Electronic Circuits & Components page. You can use the mouse to adjust the potentiometer and see how the collector current changes with the base current. Note the worksheet and simulation buttons at lower left.

Along the bottom of the screen were a series of buttons letting you select such things as Exit, Help and Setup. Setup lets you configure the program to use a soundcard (if you have one installed), and to select the default word processor and paint program.

Once this had all been done, it was time to start exploring. The Parts Gallery is, as you would expect, an illustrated guide to a range of common components, with each page showing a photo of a typical part, with a couple of paragraphs of description, usual values and tolerance.

There are around eight to 12 examples of each component type, in nine categories including: resistors, capacitors, inductors, diodes, transistors, ICs, etc. The photos themselves are 380 x 258 pixels in size, are surprisingly clear and display each component quite accurately.

Each page contains a set of play-pause-stop buttons that control the audio commentary. This is just the text description read aloud, presumably by Mike Tooley himself, but it does help bring the textbook to life and presents less of a temptation to gloss over the text as you move from one page to the next.

As well as the component gallery, there are 10 pages in the Symbol gallery that cover the schematic symbols for nearly all the components listed. It is interesting to see that they include both the standard ANSI and the (older style) DIN symbols for most components.

Two quizzes help to consolidate all the information. These are simple multiple choice questions where you try to identi-

fy the displayed component or symbol.

An index button at the bottom of the screen lets you look up a particular type of component and will then take you directly to the relevant page. As each page leads on to the next, it is easy to simply browse from there to other associated components.

The last section of The Parts Gallery is the Circuits section, where there are a dozen photos of components taken *in situ*. The text (and narrative) in each case describes what the component is doing and points out any associated support components in the piece of equipment.

Circuits & Components

The other program, Electronic Circuits and Components (ECC), perhaps fits the title of textbook a little more accurately. The interface is identical to Parts Gallery, and this time it contains six 'chapters' including: fundamentals, passive components, semiconductors, passive circuits and active circuits.

Fundamentals takes you through a comprehensive tutorial covering everything from SI units and Ohm's law through to electrostatics and magnetic fields. There are separate sections that deal with AC circuits and DC circuits and as a result, nearly all of the basic principles are covered.

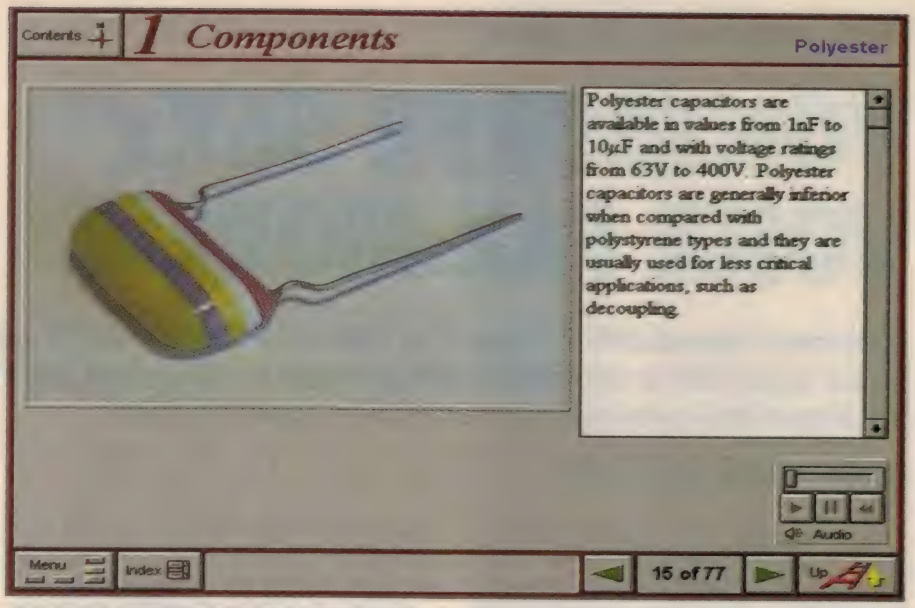
One aspect of ECC that I found particularly appealing was that almost every page contained some form of interactive control that could be operated by the user. For example, the page illustrating different types of waveform (sine, square triangle, etc.) contains a representation of an oscilloscope screen, where you can select different volts, samples and time per division settings for a range of input signals.

This graphically demonstrates the effects of these settings, and helps you get a feel for the concepts covered. Other pages may simply have arrows indicating current flow that appear when you click on a switch. But it's all good fun and, again, it prompts you to explore rather than gloss over it all...

The other chapters run along similar lines, although with fewer 'gadgets' to play with. But as these deal with circuits rather that fundamental principles, it is probably best that they use the more useful approach of circuit simulation.

Simulation

On around 25 pages throughout ECC there appears a circuit simulation button. This provides a link from ECC into Electronics Workbench (if you have it installed), which will load in the circuit being described so that you can simulate it. (If you're not familiar with Electronics Workbench, see our reviews of it in the September 1997 and July 1996 issues of *Electronics Australia*.)



Above is a typical page from The Parts Gallery, showing the details of a polyester capacitor. Both the picture and the text can be copied to the clipboard for use in your own documents.

The idea is that after reading all the theory behind a circuit's operation, you can then go straight to a working example and try it out. It's a good idea and it seems to work. The only point I would make is that it assumes that you already have Electronics Workbench installed.

I mentioned before that you could set up The Parts Gallery and ECC to use a word processor and paint program. This is so that text and images from the two textbooks can be transferred to these programs, so that you can use the material in notes, reports and the like. ECC can also produce work sheets for some of the circuits described, with the idea that you print them out and use them when building up the circuits. Other pages contain a number of spot test questions, with worked answers available at the push of a button.

Parts Gallery + Circuits & Components

Two textbooks on one CD-ROM, covering the very basics of electronics up to University entrance level.

Good points: No fuss set up, good starting place for beginners, clear and reasonably comprehensive.

Bad points: There's the odd typo, and some of the tables of terms and abbreviations aren't the clearest, but nothing serious.

RRP: $89.95.

Available: Emona Instruments, PO Box 15 Camperdown, NSW 2050; phone (02) 9519 3933 or fax (02) 9550 1378.

Any problems?

I only struck a couple of minor problems in running The Parts Gallery and ECC, none of which were at all serious. In The Parts Gallery, when running any of the quizzes I consistently got 'Property not supported by object' errors if I clicked anywhere on the screen other than one of the answer selection buttons.

ECC had a couple of problems too, in that the font used in the text descriptions couldn't handle the horizontal rules used as dividing lines in equations — these would come out as a series of 'Ä's. There was also a glaring typo on the Multiples/Submultiples page, where the multiplier for the base unit 'x10^0' (times 1) became 'x100' (times 100) — confusing if you are just learning about multiple units for the first time.

Still, you can probably pick holes in almost any reference work, and so with these small quibbles aside, both The Parts Gallery and Electronic Circuits & Components are smooth professional productions and are certainly more fun than a conventional textbook.

Keep in mind that no book can replace actual hands-on teaching in the subject, and that you won't be able to come away from these textbooks with a comprehensive knowledge of electronics. But if you are thinking of getting into electronics, then this is a good place to start.

If you are interested, you can download a demo version of the textbooks from Emona's web site, at http://www.emona.com.au. It is around 4.2MB in size, but if you want to try it out, it would be well worth the download time. ❖

56k modem review:

VOICESURFR 56Kx VOICE FAX MODEM

Motorola's VoiceSURFR is the first 56k voice modem we've come across, so we thought we'd take a quick look to see what it had going for it. Quite a lot, as it turned out — not just in features but also in the comprehensive software supplied as well.

by GRAHAM CATTLEY

56Kflex seems to be growing in popularity in Australia, with only a few of the opposing 'x2' 56k modems on the market. 56Kflex and x2 have been battling it out recently, in the hopes that the more popular system will be accepted as the 56k standard by the ITU later this year.

Looking on from the sidelines, it would seem as though 56Kflex is starting to become the *de facto* standard, with the majority of ISPs around the world plumping for the 56Kflex system.

Good reason then to look at Motorola's VoiceSURFR, a 56Kflex fax and data modem which has all the usual modem features along with the added benefit of voice capability. These extra voice functions allow the modem to act as a telephone answering machine as well as a hands-free speakerphone, and can even provide voicemail facilities as well.

Nearly all of these functions are implemented in software that runs on your PC, with recorded messages (both incoming and outgoing) saved to disk as audio files.

Sticky feet

The VoiceSURFR measures 162 x 134 x 38mm, and weighs just under 300g. The light beige plastic case has a nice solid feel about it, and the four slightly tacky rubber feet keep it fixed rather securely to the desktop. I mention this because almost all other (external) modems I've come across tend to be dragged off the back of the desk by the multitude of wires and cables that are connected to the back of them...

The modem comes with a DB25 to DB25 serial cable and a two-metre Australian phone cord, along with a cable to connect the modem to your sound card. The VoiceSURFR will drive a small set of PC speakers directly, but if you want to make use of the voicemail or speakerphone facilities you will need to connect it to a sound card in your PC.

The VoiceSURFR also comes with a miniature external microphone and holder that can be secured to the front of the computer monitor. This gives far better results that the usual method of mounting the microphone inside the modem case itself, which tends to filter (and resonate at) certain frequencies — making it sound like you are speaking from inside a shoebox.

A bare minimum of status LEDs are mounted on the top face of the modem, while the back panel contains the usual DB25 serial port, external speaker and microphone sockets, twin phone sockets and a 2.5mm DC power connector for the supplied 12V AC plugpack.

Software

Motorola obviously went to a lot of trouble on the software side of things, and supply with the VoiceSURFR a total of two floppy disks *and* a CD-ROM. Unfortunately the supplied documentation left a lot to be desired — a 32 page instruction book containing only five pages printed in English, along with four loose pages cut out of a book covering the Win 3.1x installation. As I was running Win95, the setup procedure was quite straightforward, as the modem was autodetected by my system on bootup.

Motorola's VoiceSURFR is available in both the external model reviewed here, and an internal ISA version. Both are well priced, and offer the full range of voice features.

The modem's manual informed me that I *must* run a program called COUNTRY.EXE, supplied on one of the floppies. Running this brought up a screenfull of Australasian flags, with the prompt to click on the flag of the country the modem is being used in. After clicking on the Australian flag, I was informed that the modem had been configured to suit the Australian phone system — all very painless, and as it turned out, quite successful.

The CD contained the main fax and voice software, as well as the user's manual proper — stored on disk as a series of PDF files. A copy of Adobe Acrobat reader was included, and so it was possible to read the manual on screen, or print out the relevant pages (I must say, though, that I still prefer the old-fashioned idea of reading through a printed and bound manual — it's so much faster than scrolling through page after page on screen).

SuperVoice

The voice features of the VoiceSURFR were well demonstrated by the supplied voice and fax software SuperVoice v2.2e, developed by Pacific Image Communications. Its a fairly large application (around 10MB fully installed) but is quite simple to drive. A main control panel lets you access all the voice and fax functions, and can be configured to set up separate letterboxes for incoming messages. You can set up distinctive ring for voice and fax calls, and it also claims to support caller ID, but whether this is compatible with the soon to be implemented Australian system isn't clear.

One feature that could be very useful is the ability to set up SuperVoice as a mini bulletin board system. Files on the host computer can be selected in a setup screen, and they will then be available for callers to download. This can be quite handy if (like me) you forget to bring files home from work. As long as the host computer is running, you can call it up and download anything from the selected list. Of course there is a password protection scheme, and so different people can have different files available to them when they call.

Conclusion

All up, Motorola's VoiceSURFR came across quite well. The only problems I had with it was in setting up the fax printer driver, which didn't want to install. But from the straightforward nature of the rest of the software, the problem is more than likely to be in my system, rather than in the software.

Apart from that, I couldn't really fault the VoiceSURFR — it is mechanically well designed, performs well, and is comparatively cheap at $250 including tax. As 56Kflex seems to gaining popularity, it would seem to be an all round good buy, especially as you get the extra voice functions for the price of a standard modem. ❖

The VoiceSURFR

Motorola's VoiceSURFR voice fax and data modem, using the 56Kflex protocol. Supplied with all cables, software and an external microphone.

Good points: Comes with external microphone, giving much improved sound quality. Full function software is easy to drive, and is easily configured to Australian conditions.

Bad points: Nothing, really.

RRP: $250 for the external model, and $216 for the internal ISA version (including tax).

Available: Most major computer stores, or contact Synnex Australia at 29-31 Clarinda Road, Oakleigh South 3167; phone (03) 9540 0555, fax (03) 9540 0588.

Computer News and New Products

True 1200dpi HP laser printers

Hewlett-Packard has released the HP LaserJet 4000 family of printers, cited as the company's most technologically advanced laser printers. The new family replaces the LaserJet 5 printer family.

The new printers feature a throughput of 17 pages per minute (ppm), a print resolution of 1200 dots per inch, and are fitted with a 100MHz processor, which makes them 40% faster than the 12ppm printers they replace. As well, they are optimised for network printing.

Features of the new printers include an instant-on fuser that eliminates printer warm-up time, 1200dpi at full engine speed, a new 10,000 page cartridge with five-micron toner particles (compared to six micron), and emulation of Adobe PostScript Level 2 language at no extra charge.

Key software features include an Internet installer that automatically downloads the newest HP LaserJet 4000 printer's Microsoft Windows print system components from HP's Web site; a common installer for all version of Windows, and a 'page view' function. The expected retail price (incl tax) is $2323 for the basic LaserJet 4000 and up to $3277 for the LaserJet 4000TN.

For further information circle 165 on the reader service card, phone the HP Customer Information Centre on 131347 or visit the HP Web site at **http://www.hp.com**.

LAN capable international modem card

TDK's new GlobalNetworker 3410 and 3412 V.34 data/fax modem PCMCIA cards come with built-in Ethernet LAN capability. They are compatible with IBM PC compatible laptops and support 10Base-T wiring. The 3412 supports 10Base-2 wiring. Each card supports 33.6kb/s data, 14.4kb/s send and receive fax, data compression and error correction using an internal phone line interface.

With internal, programmable DAA phone line circuitry, the cards are certified and legal for use in telephone systems around the world. The country is selected from a pull-down menu.

For further information circle 163 on the reader service coupon or contact TDK, 22 Lambs Road, Artarmon 2064.

EDA package update

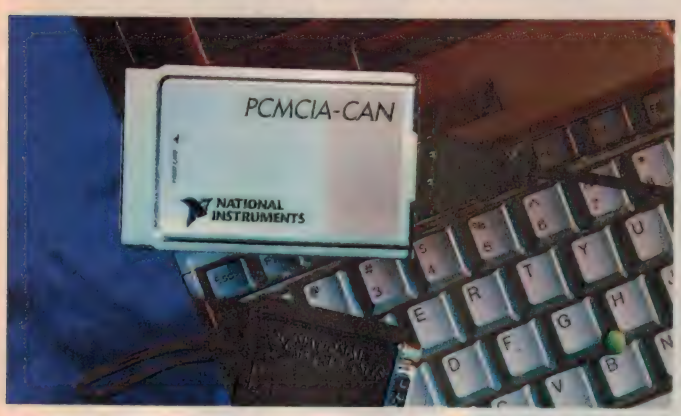
Version 1.51 of EDWin, a Windows-based electronic design package has now been released, containing numerous changes and improvements. The capacity of the database has been increased by four times, and there are now more import and export filters.

As well as bug corrections, several new functions have been implemented in the Schematics Capture editor. For example, the Autoplacer and Autorouter, previously separate modules, are now incorporated in the editor. As an option, a thermal analyser can now be included. Based on thermal parameters of the components and the environment, the analyser calculates and shows temperatures for the finished printed circuit board design.

The library of simulation models (simulation primitives) has been extended to 282 models and now includes thyristors, memory chips and the 8051 microcontroller. As well, EDWin has now integrated a second simulator called EDSpice and includes a simulation engine compatible with XSpice. Prices start from $100 for a 100-component version of the program.

For further information circle 160 on the reader service coupon or contact Fineline, 6 Irvine Crescent, Yarra Glen 3775; phone (03) 9730 1083.

PCMCIA connects PC to CAN devices



National Instruments has announced a PCMCIA-based, Windows 95 compatible interface that connects a notebook PC to controller area network (CAN) devices. The card meets the physical and electrical requirements for in-vehicle or industrial networks based on CAN. It includes Ni-Can driver software, which provides a high-level application programming interface (API) for reading and writing data frames on the CAN bus.

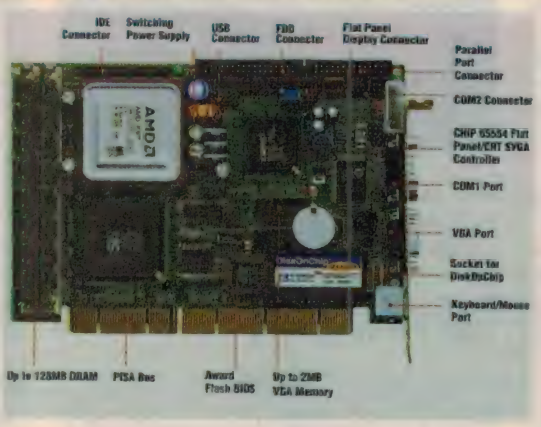
The card gives connectivity to communications networks in both test and industrial automation applications, including automotive testing and diagnostics, factory automation and machine control. It is compatible with the company's LabView, BridgeView, Lookout and LabWindows/CVI application software, as well as other industry standard programming languages.

For further information circle 162 on the reader service coupon or contact National Instruments Australia, PO Box 466, Ringwood 3134.

Half-size Pentium SBC with PISA bus

Amtex Electronics has released the SBC554V, a half-size Pentium single board computer (SBC) with both PCI and ISA buses — PISA for short. Measuring 185 x 122mm, it supports Intel P54C, P55C (MMX), or AMD KS/K6, or Cyrix MI/M2 CPUs.

The computer has an on board disk-on-chip (SSD) of up to 24MB, two RS-232 serial ports and one parallel port, enhanced IDE drives, watchdog timer and a 10-year lithium battery.



The built-in VGA interface can display both a CRT and a flat panel display simultaneously. Maximum resolution is 1024 x 768 at 64k colours. An on-board 512KB pipeline burst L2 cache is standard and the board also supports LVDS (low voltage differential signalling) for high speed and low power data transfer.

For further information circle 167 on the reader service coupon or contact Amtex Electronics, 2A Angas Street, Meadowbank 2114; phone (02) 9809 5022.

Inkjet printer server

Intelligent Technologies has released what the company claims as the market's first dedicated inkjet print server. The PrintPoint 140 BJC, designed and manufactured in conjunction with Canon, is said to seamlessly integrate Canon's range of Bubble Jet colour printers into an organisation's network. "Compared to colour laser printers, bubble jet printers are more cost effective for smaller organisations", said Ian Degarnham, managing director of Intelligent Technologies. "Our new system provides a method for networking bubble jet printers, and needs little technical knowledge for installation and operation."

Key features include simultaneous support for Netware, all Windows platforms, OS/2 LAN Server, LANtastic; a throughput up to 10 times faster than from a PC; and complete support for printing over both NetBIOS/NetBEUI and TCP/IP in Windows NT. The RRP is $340 (excl tax).

For further information circle 166 on the reader service coupon or contact Intelligent Technologies P/L, PO Box 1169, Parramatta 2124.

New enhanced Zip drive

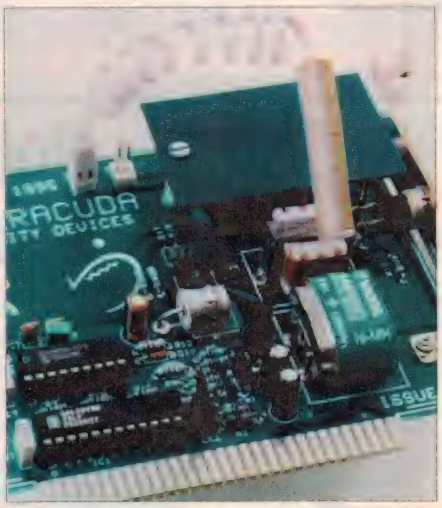
Iomega Corporation has announced the ZipPlus drive, which includes a range of enhancements compared to the standard Zip drive. These include easier connections, faster performance and multimedia software. The new drive can also be used with either a SCSI or a parallel port.

According to the company, the new drive offers Windows '95 users a speed increase of up to 40% in the most commonly performed PC functions such as opening, saving, dragging and dropping files. As well, the drive comes with a palm-sized universal power supply which is compatible with voltages from 100 to 240 volts, and an on-off switch for power savings.

For further information circle 164 on the reader service coupon, see your local computer dealer or contact Iomega Corporation, Suite 18, 12 Tryon Road, Lindfield 2070.

Security device for desktop PCs

Theft of a desktop computer system can now be deterred by fitting a Barracuda security device developed by British company BSD (Europe) Ltd. A 120dB siren operates if the computer is disconnected from its power supply or if it's moved, and a jet of harmless indelible red dye is discharged onto specific components in the event of any unauthorised attempt to open the computer's casing. The dye stains specific components such as processor chips and memory modules, without damaging them. The dye makes these parts more difficult to sell and, consequently, of less value to thieves.



The device is said to be easily installed and fits into any free 8/16 bit expansion slot in any ISA compatible computer. It is activated and controlled by installing software from the supplied setup disk. The software allows the alarm sensitivity to be set, and is also used to arm or disarm the system, via a personal code. BSD is now seeking an Australian agent for the product.

For further information, contact the British Consulate General on (02) 9247 7521 (NSW/ACT), (07) 3236 1634 (Qld), (03) 9650 3699 (Vic and Tas), (08) 9221 4422 (WA and NT) or (08) 8212 7280 (SA). ❖

WEBWATCH

presented by GRAHAM CATTLEY

The Digital Music Zone

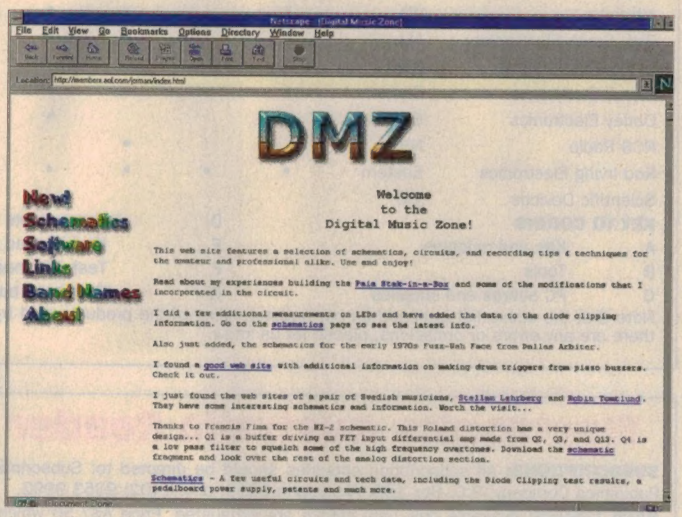
http://members.aol.com/jorman/index.html

Jack Orman runs this site devoted to electronic music in its many forms, with a special emphasis on the electronic side of music production and reproduction. Of particular interest is the schematics page, which gives you access to heaps of music related circuit diagrams, on anything from a whisper compressor to a pedalboard power supply.

Despite its title, the Digital Music Zone puts a strong emphasis on analog electronics, with particular attention paid to guitars and effects boxes, clipping, distortion and how best to get that 'tube' sound.

As well, there are tips on recording, a rather short list of music software to download, and a nice healthy link list of related music sites.

It's the place to go if you want to build your own flanger, phaser or audio delay line, and it contains schematics of a lot of commercial equipment.



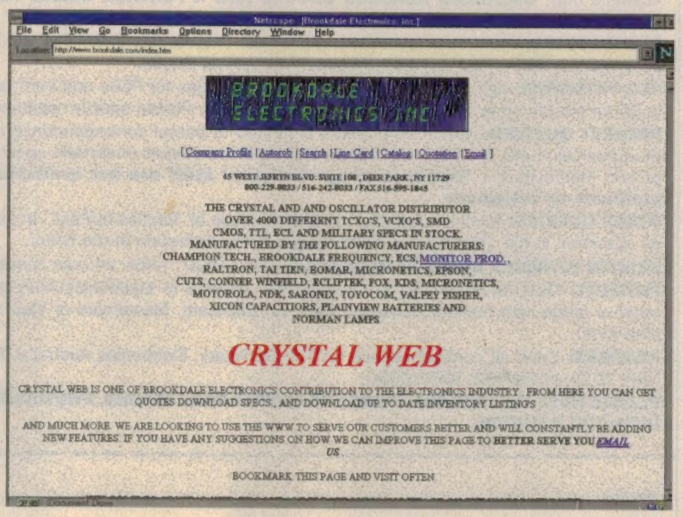
Brookdale Electronics' Crystal Net

http://brookdale.com/index.htm

I presented a good passive component site last month, but here's a site that covers one component that is critical in a huge number of systems, but is often overlooked. Crystals, VCOs, VCXOs, TCXOs — they're all here, and thanks to the efforts of Brookdale, you can view the datasheets for a multitude of frequency control devices from over 25 different manufacturers.

There's data on over 4000 devices, and it is all indexed according to manufacturer. Don't worry though, if you are looking for a specific crystal or oscillator you can use the AutoRob search engine to find the data you want. You can also include frequency parameters, oscillation mode and so on to come up with a list of suitable devices.

You can download a zipped-up copy of Brookdale's inventory, place an order, or let Brookdale select the right device for you as part of their free quote service.



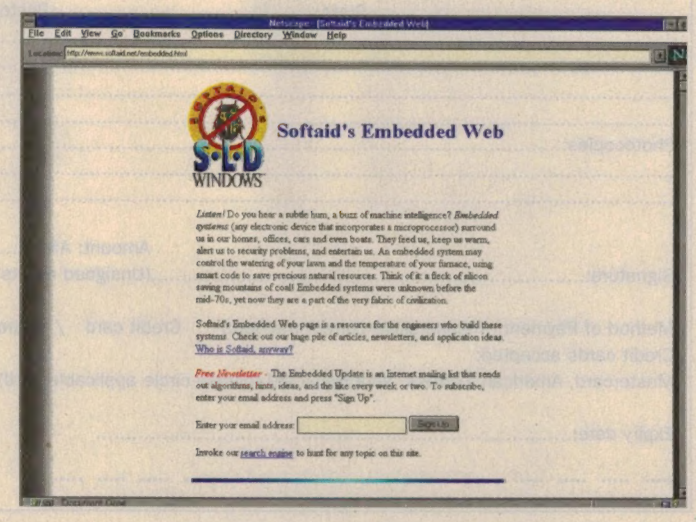
Softaid's Embedded Web

http://www.softaid.net/embedded.html

I stumbled across this quite by accident, and it turned out to be one of the most interesting sites I've come across. Softaid is a company that designs and sells in-circuit emulators and source debuggers for 8 and 16 bit microprocessors.

Although the the site is aimed more at people designing and building embedded systems, a lot of the information is applicable to other fields as well. There's a huge pile of articles culled from publications all over the world, and these on their own make the site worth adding to your list. Added to these are a swag of application ideas, and even a free newsletter called The Embedded Update. This is sent out every couple of weeks or so, and contains algorithms, hints and ideas, and is well worth receiving.

There are, of course links to other embedded sites on the net, as well as tutorials on embedded systems and back issues of the newsletters. And to top it all off there is a whole page of techie jokes to keep you amused as well... All in all, a five-star site and thoroughly recommended. ❖



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KEY TO CODING

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OTHER QUERIES: Technical queries outside the scope of 'Replies by Post', or submitted without fee, may be answered in the 'Information Centre' pages at the discretion of the Editor.

READER SERVICES BULLETIN BOARD: (02) 9353 0627; ANSI, 24 hour access; any rate to 28.8kb/s.

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ADDRESS: Send all correspondence to: The Secretary, Electronics Australia, P.O. Box 199, Alexandria NSW 2015; phone (02) 9353 0620.

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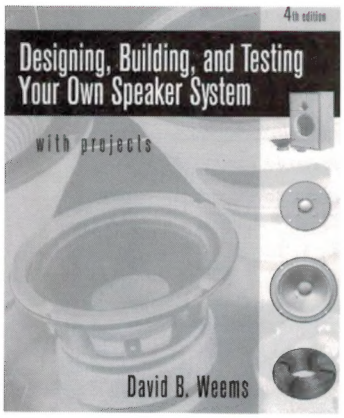

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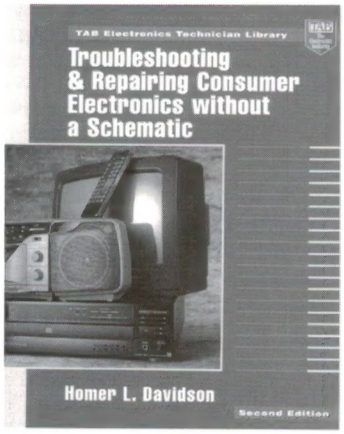

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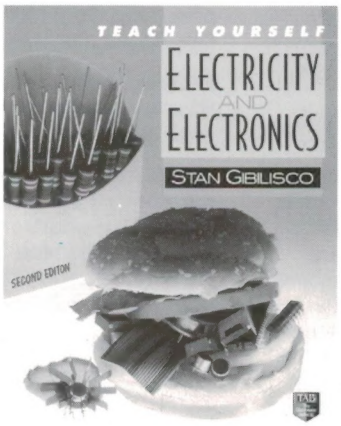

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